# APPENDIX A

# FIELD SAMPLING AND ANALYSIS PLAN

FOR

## REMOVAL ~~ACTIVITIES~~ACTION WORK PLAN

AT THE

## TOLEDO TIE TREATMENT SITE

LOCATED AT

**ARCO INDUSTRIAL PARK**
**TOLEDO, OHIO**

~~FEBRUARY 1998~~
March 18, 1998
Revision 1

Prepared For:

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# A.1.0 INTRODUCTION

## A.1.1 General

Kerr-McGee Chemical Corporation (Kerr-McGee) retained Hull & Associates, Inc. (HAI) to address the removal activities outlined in the Unilateral Administrative Order, Docket No. CERCLA VW-98-C-444, pursuant to Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. Section 9606(a), regarding the Toledo Tie Treatment Site (Site). This field sampling and analysis plan (FSAP), prepared for Kerr-McGee, provides field sampling and analysis guidelines, as well as supports the activities described in the removal action work plan (Work Plan)(HAI Document #PWM001D.002).

The FSAP is intended to provide guidelines for field sample preparation, collection, handling, and analysis procedures. Whenever appropriate, references have been made to HAI Standard Operating Procedures (SOPs) provided in Attachment A. While this document details sampling and analysis procedures, it is not meant to be a stand alone document, and should be used in conjunction with the Quality Assurance Project Plan (HAI Document # PWM001D.001), included as Appendix C of the Work Plan.

## A.1.2 Sampling Overview

The work outlined under this FSAP contains the methods and procedures necessary to characterize the extent of contaminants for a removal action and obtain representative environmental samples from three media sets: sediment, soils, and surface water. Sediments and surface water will be collected from Williams Ditch and characterized to identify the immediate source areas of contaminants within Williams Ditch as required in Task 6 of the Work Plan. Soils will be collected from borings near the former lagoons as required in Task 4 of the Work Plan. Table AI summarizes the number of samples proposed and the associated analytical methods. Sampling teams will be used during the majority of sampling and data collection activities. Sampling teams will consist of a designated leader and technical support personnel. The sample team leader's responsibilities consist of ensuring that data are collected within the constraints of this plan and the QAPP (HAI Document #PWM001D.001), maintaining primary communications between the sample team and project management, and reporting potential health and safety threats imposed by equipment, weather, geography, or hazardous materials to the Project or Health and Safety Manager.

### A.1.2.1 Sediment Sampling and Profiling

Sediment investigation activities consist of visually determining thickness of creosote contaminated sediment, collecting, ~~visually characterizing~~, characterizing visually, and shipping samples ~~of coal tar creosote~~ for chemical analysis. Chemicals of concern to be analyzed consist of polycyclic aromatic hydrocarbons (PAHs) consisting of acenaphthene, benzo(a)pyrene, chyrsene, dibenzo(a,h)anthracene, fluoranthene, naphthalene, and pyrene ~~(U.S. EPA Method OLM03.2).~~ Sediment samples will be analyzed by U.S. EPA Method 8100. Four sediment samples will be analyzed for the U.S. EPA Appendix IX~~9~~ List, from 40CFR Part 264~~, which is~~ ~~defined in the QAPP~~.

### A.1.2.2 Soil Sampling

Soil sampling activities consist of profiling extent of cresosote compounds in the soils using a cone penetrometer testing (CPT)/deployed laser induced fluorescence (LIF) method (LIF spectroscopy is synonymous with rapid optical screening). Based on the results of the CPT/LIF profile, a soil sample will be collected, visually characterized, and shipped for chemical analysis. Chemicals of concern to be analyzed consist of polycyclic aromatic hydrocarbons (PAHs) consisting of acenaphthene, benzo(a)pyrene, chyrsene, dibenzo(a,h)anthracene, fluoranthene, naphthalene, and pyrene (U.S. EPA Method ~~OLM03.2~~ 8270). Physical characteristics will also be determined to evaluate dewatering and other material handling considerations.

Up to five test pits will also be excavated to validate the LIF response in areas where the CPT borings do not indicate the presence of creosote-related contamination or the relative flourescence intensity indicates minor contamination.

### A.1.2.3 Surface Water Sampling

The surface water investigation of Williams Ditch consists of collecting representative surface water samples, visually characterizing, and shipping samples for chemical analysis. Analytes of concern consist of PAHs consisting of acenaphthene, benzo(a)pyrene, chyrsene, dibenzo(a,h)anthracene, fluoranthene, naphthalene, and pyrene (U.S. EPA Method ~~OLM03.2~~ 8270).

# A.2.0 SEDIMENT SAMPLING

## A.2.1 Sample Locations

The proposed sediment profiling locations are presented on Figure A.1. These locations are spaced on approximately 200 to 250 foot centers along Williams Ditch between Byrne Road and Hill Avenue. The profiles are designated PFL-1 through PFL-13. At each profile, three cores will be taken: one in the middle; and one approximately 3 feet from each shore of Williams ditch. The thickness of creosote observed in each core will be measured and recorded. Then the sediments from each of the three cores, from a single profile location, will be mixed together and sampled. A single background sediment sample will be collected from Williams Ditch south of the railroad tracks west of Byrne Road.

## A.2.2 Sample Identification (Labeling) and Designation (Numbering)

Sediment samples will be identified according to the following Sample Identification Number (SIN) as stated in Section C.4.2.3 of the QAPP (HAI Document #PWM001D.001). An example of a valid SIN for a sediment sample would be as follows:

```
PWM001        SED        001  D157
|             |            |   |
|             |            |         +--------- Employee Number
|             |            +-------------- Sample Number
|             +------------------------ Sediment Profile Location Sample Type
+-------------------------------- Project Number
```

The identification of the sediment samples will provide the project number~~, sediment profile location~~media type, sample number, and identification of the sample collector.

## A.2.3 Sampling Equipment, Supplies, and Instrumentation

Sediment samples will be collected using a extendible core sampler or equivalent, in accordance with HAI SOPs F3012 and/or F3019, adhering to ASTM D 4823-95, Standard Guide for Core Sampling Submerged, Unconsolidated Sediments.

## A.2.4 Sample Handling, Preservation Methods, and Blank Samples

For quality assurance purposes, one field blank will be collected for every 10 samples analyzed or a minimum of one per day. The sample will be collected by decontaminating the sampler according to HAI SOP No. F1000 and then passing laboratory-supplied water through the sampler. The water will be collected in the properly preserved containers specified in Table C.2 of the QAPP (HAI Document #PWM001D.001). The sample will be analyzed for the same parameters as the sediment samples.

Samples collected for chemical or physical analysis will be stored in a manner to prevent the samples from freezing in cold weather. Samples collected in weather conditions above freezing for chemical analysis will be stored near 4°C by placing them on ice in an insulated container immediately after the samples are collected.

## A.2.5 Sample Analysis Parameters

Nine sediment samples, collected from east of Arco Drive, will be analyzed for PAHs in accordance with U.S. EPA Method ~~OLM03.2~~ 8270. Four ~~Three~~ sediment samples collected from west of Arco Drive(these include one background sample) and one from east of Arco Drive will be analyzed for U.S. EPA Appendix IX9 List from 40CFR Part 264, which is described in the QAPP (HAI Document #PW001D.001 (Table A-1). ~~Table C.2 of the QAPP (HAI Document #PWM001D.001) identifies the analytical methods, data quality objectives, and QA/QC protocol for each sample matrix and location~~

## A.2.6 Chain-of-Custody

The chain-of-custody will trace possession and handling of individual samples from the time of field collection through laboratory delivery and analysis. The chain-of-custody program consist of procedures for sample labeling, sample sealing, field log recording, record keeping, and laboratory logging.

**Sample Labeling** - All sample labels will contain the following information:

Project number
Sample media
Sample location
Name of the collector

**Record Keeping** - The chain-of-custody record will be maintained to trace sample possession and time of collection. The chain-of-custody record will accompany each sample and should be clearly marked with the following information:

1. Site Location
2. Project Manager (name and telephone number)
3. Sample Identification Number
4. Signature of collectors
5. Date and time of collection~~;~~
6. Sample type~~;~~
7. Number of containers~~;~~
8. Analytical parameters requested
9. Preservatives
10. Signature of relinquishee and dates of possession by each party

**Sample Seal** - A seal will be placed on the sample container or on the shipping container to ensure that samples have not been disturbed during transportation.

**Field Log Recording** - An up-to-date field log book will be kept by each sampling team (if more than one group is sampling). The log book will contain the following:

1. Weather Conditions
2. Date and time of sample collection
2. Sampling sequence
3. Types of sample containers used
4. Sample I.D. numbers
5. Parameters requested for analysis/preservatives
6. Field collection methods
7. Destination (lab) and transporter
8. Field observations
9. Samplers

**Laboratory Logbook** The laboratory will maintain a record of the processing steps that are applied to each sample (i.e. sample preparation techniques, instrumental methods, experimental conditions QC results). The time, date, and name of the person performing each processing will also be recorded.

## A.2.7 Sediment Classification and Field Description Log

Samples will be classified in the field according to HAI SOP No. F1006. Samples will be chosen for textural physical analyses at the discretion of the field hydrogeologist.

## A.2.8 Decontamination of Equipment

The sediment sampling equipment will be decontaminated in accordance with HAI SOP No. F1000. The decontamination rinse water will be collected, containerized, and stored until proper disposal can be arranged.

## A.2.9 Disposal of Unused Sediment Samples

The extraneous sediments that remain following sample collection will be properly stored in DOT approved 55-gallon drums and secured according to HAI SOP No. F2013. The drums will be clearly labeled with a permanent marker or paint pen. Label information consist of Site Identification, type of material, generation date, and sampler's initials.

The drummed extraneous sediments will be analyzed for TCLP in accordance with EPA Method 1311 and subsequent analyses for ~~ignitability in accordance with EPA Method 1010,~~ regulated volatile organics, ~~and~~ metals, and ignitability in accordance with EPA Method 1010 (Table A-1). Additional analyses may be required by the accepting waste disposal facility for further characterization.

Documentation will consist of completing a chain-of-custody record as described in HAI SOP No. F3014 and Section C.5.0 of the QAPP (HAI Document No. PWM001D.001). The drums included with each composite sample will be noted on the "comments" section of the chain-of-custody.

## A.3.0 SOIL SAMPLING

### A.3.1 Sample Locations

The proposed boring location grid is comprised of approximately ~~60~~ 65 soil borings placed on approximately 50 foot centers, as presented on Figure A.2 and summarized on Table A-1. These locations are designated PLG-1 through PLG-~~65~~ 65. However, the location of these borings are only proposed and the exact number and location of the borings may change based on field observations. Each boring will be continuously measured using a cone penetrometer testing (CPT)/deployed laser induced fluorescence (LIF) to a depth of approximately 15 feet. The boring information will be used to delineate the horizontal and vertical extent of cresosote compounds near the former lagoons. One background soil sample will be collected near the other background samples.

### A.3.2 Sample Identification (Labeling) and Designation (Numbering)

Soil samples will be identified according to the following Sample Identification Number (SIN) as stated in Section C.4.2.3 of the QAPP (HAI Document #PWM001D.001). An example of a valid SIN for a soil sample would be as follows:

```
PWM001    SB1       SS2    D157
  |        |         |      |
  |        |         |      +---------- Employee Number
  |        |         +--------------- Soil Sample LocationSample Number
  |        +------------------------- Boring Location Number
  +---------------------------------- Project Number
```

The identification of the soil samples will provide the project number, boring number, sample number (e.g., ~~sediment~~ sample location), and identification of the sample collector. The sample numbers provided information regarding depth.

### A.3.3 Sampling Equipment, Supplies, and Instrumentation

The physical characteristics of the unconsolidated materials will be evaluated using the CPT and direct push technology. In accordance with ASTM Standard D 3441, the cone is typically advanced at a rate of 2 centimeters per second with the driving force of hydraulic rams. Sensors contained in the CPT tip continuously log tip pressure and sleeve friction. The data from these sensors corresponds to soil type and are used to map stratigraphy. Simultaneouslyly with the CPT push, LIF spectroscopy will be used to determine the presence of creosote in the soil (LIF spectroscopy is synonymous with the phrase rapid optical screening). Essentially the system consists of an excitation laser and fiber optics. Light from the laser passes through a sapphire window ( located outside of the stainless-steel probe above the CPT tip) and is directed onto the soil as the CPT probe is advanced. The laser light fluoresces aromatics in the soils, and the fiber optics return this information to the surface. The intensity of the fluorescence corresponds to aromatic concentrations. Thus, this method provides qualitative and semi-quantitative information regarding PAH contamination in subsurface soil samples. One soil sample will be collected from 10 percent of the borings for chemical analysis of PAHs based on the CPT/LIF results. The confirmation samples will be evenly collected from borings showing both low and high LIF response using direct push methods to correlate LIF response. Ten percent confirmation sampling is sufficient to provide ~~air~~ adequate correlation between the LIF response and the chemical analysis results.

Confirmatory test pits will be included in the intrusive program to provide additional correlation of the CPT/LIF technology. A total of five test pits will be excavated to validate the LIF response in areas where the CPT borings do not indicate the presence of creosote related contamination of the relative flurescence intensity dindicates minor creosote-related contamination. Should areas of heavy contamination be encountered, or should groundwater enter the test hole at a rate that cannot be practically controlled, the test pit will be immediately terminated and any excavation material re-interned into the original hole. Water will be removed from the test holes only to the extent necessary to confirm stratigraphy and/or the absence of creosote-related contamination. Soils and other soild material excavated from any test pit will be placed immediately adjacent to the hole on Visqueen sheet(s) and reinterned in the original hole following visual observation of subsurface conditions.

## A.3.4 Sample Handling, Preservation Methods, and Blank Samples

For quality assurance purposes, one field blank will be collected for every 20 samples analyzed or a minimum of one per day. The sample will be collected by decontaminating the sampler according to HAI SOP No.

F1000 and then passing laboratory-supplied water through the sampler. The water will be collected in the properly preserved containers specified in Table C.2 of the QAPP (HAI Document #PWM001D.001). The sample will be analyzed for the same parameters described in Section A.3.3.

Samples collected for chemical or physical analysis will be stored in a manner to prevent the samples from freezing in cold weather. Samples collected in weather conditions above freezing for chemical analysis will be stored near 4°C by placing them on ice in an insulated container immediately after the samples are collected.

### A.3.5 Sample Analysis Parameters

Soil samples will be analyzed for PAHs in accordance with U.S. EPA Method 8270 (Table A-1). ~~OLM03.2. Table C.2 of the QAPP (HAI Document #PWM001D.001) identifies the analytical methods, data quality objectives, and QA/QC protocol for each sample matrix and location~~The background sample will be analyzed for Appendix IX 40 CFR 264.

### A.3.6 Chain-of-Custody

The chain-of-custody will trace possession and handling of individual samples from the time of field collection through laboratory delivery and analysis. The chain-of-custody program consist of procedures for sample labeling, sample sealing, field log recording, record keeping, and laboratory logging.

**Sample Labeling** - All sample labels will contain the following information:

Project number
Soil Boring
Sample number
Name of the collector

The record keeping, sample seals, field log recording, and the laboratory logbook will adhere to the same procedures described in Section A.2.6.

### A.3.7 Soil Classification and Field Description Log

Samples will be classified in the field according to HAI SOP No. F1006.

### A.3.8 Decontamination of Equipment

The soil sampling and profiling equipment will be decontaminated in accordance with HAI SOP No. F1000. The decontamination rinse water will be collected, containerized, and stored until proper disposal can be arranged.

### A.3.9 Disposal of Unused Soil Samples

The extraneous soils that remain following sample collection will be properly stored in DOT approved 55-gallon drums and secured according to HAI SOP No. F2013. The drums will be clearly labeled with a permanent marker or paint pen. Label information consist of Site Identification, type of material, generation date, and sampler's initials.

The drummed extraneous soils will be analyzed for TCLP in accordance with EPA Method 1311 and subsequent analyses for ~~ignitability in accordance with EPA Method 1010,~~ regulated volatile organics, and metals and ignitability in accordance with EPA Method 1010. Additional analyses may be required by the accepting waste disposal facility for further characterization.

Documentation will consist of completing a chain-of-custody record as described in HAI SOP No. F3014 and Section C.5.0 of the QAPP (HAI Document No. PWM001D.001). The drums included with each composite sample will be noted on the "comments" section of the chain-of-custody.

### A.3.10 Decommissioning of Soil Borings

Each Soil boring will be decommissioned according to HAI SOP No. F2002 (Attachment A).

# A.4.0 SURFACE WATER SAMPLING

## A.4.1 Surface Water Sampling

Surface water samples will be collected from ~~four~~five locations along Williams Ditch to determine water quality and possible impact due to coal tar (Table 1). Because PAHs have been identified as the primary COC, the~~These~~ samples will be analyzed ~~for~~only for PAHs in accordance with U.S. EPA Method ~~OLM03.2~~ 8270. The background sample will be submitted for Appendix IX analysis 40 CFR 264. Field parameters consist of pH, specific conductance, and temperature will also be measured and recorded. The sampling procedures will be in accordance with those specified in the following sections.

## A.4.2 Sampling Locations

The proposed sampling locations are presented on Figure A.1. These locations are designated SW-01 through SW-04. A background surface water sample will be collected from Williams Ditch up-gradient of the Site. The up-gradient sample location is south of the railroad tracks west of Byrne Road.

## A.4.3 Sample Identification (Labeling) and Designation (Numbering)

Surface~~Ground~~-water samples will be identified according to the following Sample Identification Number (SIN) as stated in Section B.4.2.3 of the QAPP (HAI Document #PWM001D.001). An example of a valid SIN for a surface water sample would be as follows:

```
PWM001   SW1   001   D153
|         |     |     |
|         |     |     +-- Employee Number
|         |     +------- Sample Location 01Number
|         +------------ Sample Type Station Number
+---------------- Project Number
```

## A.4.4 Sampling Equipment, Supplies, and Instrumentation

A Swing Sampler, or equivalent, will be used to collect the surface water samples from Williams Ditch in accordance with HAI SOP F3011. Clean gloves will be worn by each individual handling the sampling equipment and plastic sheeting will be placed on the ground near the sampling location to prevent the sampling equipment from directly contacting the ground. The following steps will be adhered to during sampling:

1. The sampler will be slowly lowered beneath the surface of the water and will not be dropped, since this action may cause agitation and/or -aeration, and consequently degas the water sample.

2. The sampler's contents will be slowly transferred into the proper sample container, thus minimizing agitation and aeration. Refer to Table C.2 of the QAPP (HAI Document #PWM001D.001) for a list of appropriate sample containers.

3. In order to preserve sample quality, the sampling order follows volatility of the analytes of concern. Hence, the sample containers will be filled first and then the field parameters will be measured and recorded in the following order: pH, specific conductance, and temperature.

The used sampling equipment and other protective clothing (PPE) will be properly decontaminated or disposed of properly following contact with the water. Waste sampling equipment and PPE will be temporarily stored in a plastic trash bag until it can be transported to the dedicated waste receptacle for storage at the Site.

### A.4.5 Sample Handling, Preservation Methods, and Blank Samples

The pre-preserved laboratory provided sample containers will be placed on ice in an insulated container following sample collection. The containers will be properly labeled, in the field, prior to collection, according to the procedures described in Section A.3.3. Refer to Section C.4.0 of the QAPP (HAI Document #PWM001D.001) for a more detailed description on the procedures for preservation and handling of samples and sample containers.

Trip blanks, field blanks, and duplicate samples will be collected to verify quality control and quality assurance of the that sample handling, equipment decontamination, and laboratory methods. The laboratory-prepared trip blanks will be subject to the same handling and transportation procedures as the accompanying samples. Trip blanks will be required at the rate of one per shipping container. Trip blanks must remain in the sample shipping containers during sample collection and transportation (i.e., roundtrip). To ensure that the sampling device has been effectively cleaned, field blanks will be prepared by the sampling team. The field blanks involve filling the sampling device with laboratory supplied deionized water, transferring the sample to bottles, and submitting the sample to the laboratory for analysis.

The number of field blanks analyzed for a class of compounds will be equal to at least 10 percent of the total samples to be analyzed for that class, with a minimum of one per day. It will be the sampler's responsibility to collect the appropriate number of field blanks for the day's sampling efforts.

If contaminants are found in the field or trip blanks, the source of the contamination will, if possible, be identified and corrective action, such as modifying the procedure and/or re-sampling if appropriate, will be initiated.

Field duplicates will be required at the rate of one per every ~~20~~ 10 samples collected with a minimum of one per day. It will be the sampler's responsibility to collect the appropriate number of duplicate samples.

## A.4.6 Sample Analysis Parameters

The surface water samples will be analyzed for PAHs ~~SVOCs~~ in accordance with Method 8270 ~~OLM03.2~~. Thee - required sample containers and preservatives for each analytical method are identified in Table C.2 of the QAPP (HAI Document #PWM001D.001).

## A.4.7 Chain-of-Custody

Chain-of-Custody procedures, as described in Section A.2.6 of this SAP and Section C.5.0 of the QAPP (HAI Document #PWM001D.001) will be adhered to during the sampling activities described in this document.

## A.4.8 Data Reporting and Field Logs

Detailed field logs will be recorded during sampling events to document observations and other physical and chemical factors that may affect the interpretation of analytical results. The measurements from direct reading instruments will be recorded on standard HAI data forms or other acceptable recording device.

## A.4.9 Decontamination of Field Equipment

A detailed description of the procedures that will be used to decontaminate sampling equipment is presented in HAI SOP No. F1000.

## A.5.0 REFERENCES

A variety of technical documents, administrative documents, and publications were referred to during the preparation of this document. Some of the references consulted are presented below. Referenced documents and publications may or may not have been reviewed in their entirety. The guidelines and procedures presented in the documents and publications referenced may not have been strictly adhered to unless stated otherwise.

U.S. EPA. 1986. RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD). United States Environmental Protection Agency OSWER-9950.1, 323 pp.

U.S.EPA. 1983. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans. United States Environmental Protection Agency.

U.S. EPA. 1987. A Compendium of Superfund Field Operations Methods. United States Environmental Protection Agency.

Army Corp of Engineers. 1970. Laboratory Soil Testing, Engineers Manual. 1110-2-1906.

American Society of Testing and Materials. 1988. 1990 Annual Book of ASTM Standards, "Soil and Rocks; Dimension Stone; Geosynthetics. Volume 04.08.

American Society of Testing and Materials. 1997. "ASTM Standards Relating to Environmental Site Characterization". ASTM Publication Code Number: 03-418297-38, 1410 pp.

U.S EPA. 1986. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. SW-846, 3rd Edition. United States Environmental Protection Agency.

U.S. EPA. 1983. Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79-020. United States Environmental Protection Agency.

U.S. EPA. 1988. Methods for the Determination of Organic Compounds in Drinking Water. EPA/600/4-88/039. United States Environmental Protection Agency.

## TABLE A-1

## ANALYTICAL METHODS
## WILLIAMS DITCH SEDIMENT AND SURFACE WATER SAMPLING LOCATIONS

| Media | PAHs Method 8270 | Appendix IX | Test Pits | CPT/LIF | Physical Characteristics |
|---|---|---|---|---|---|
| Sediment Williams Ditch | 9 | 4 | | | 1 |
| Surface Water Williams Ditch | 4 | 1 | | | 1 |
| Soil Former Lagoons | 7 | | 5 | 65 | 1 |
| Sediment/ Background | | 1 | | | |
| Surface Water/ Background | | 1 | | | |
| Soil/ Background | | 1 | | | |

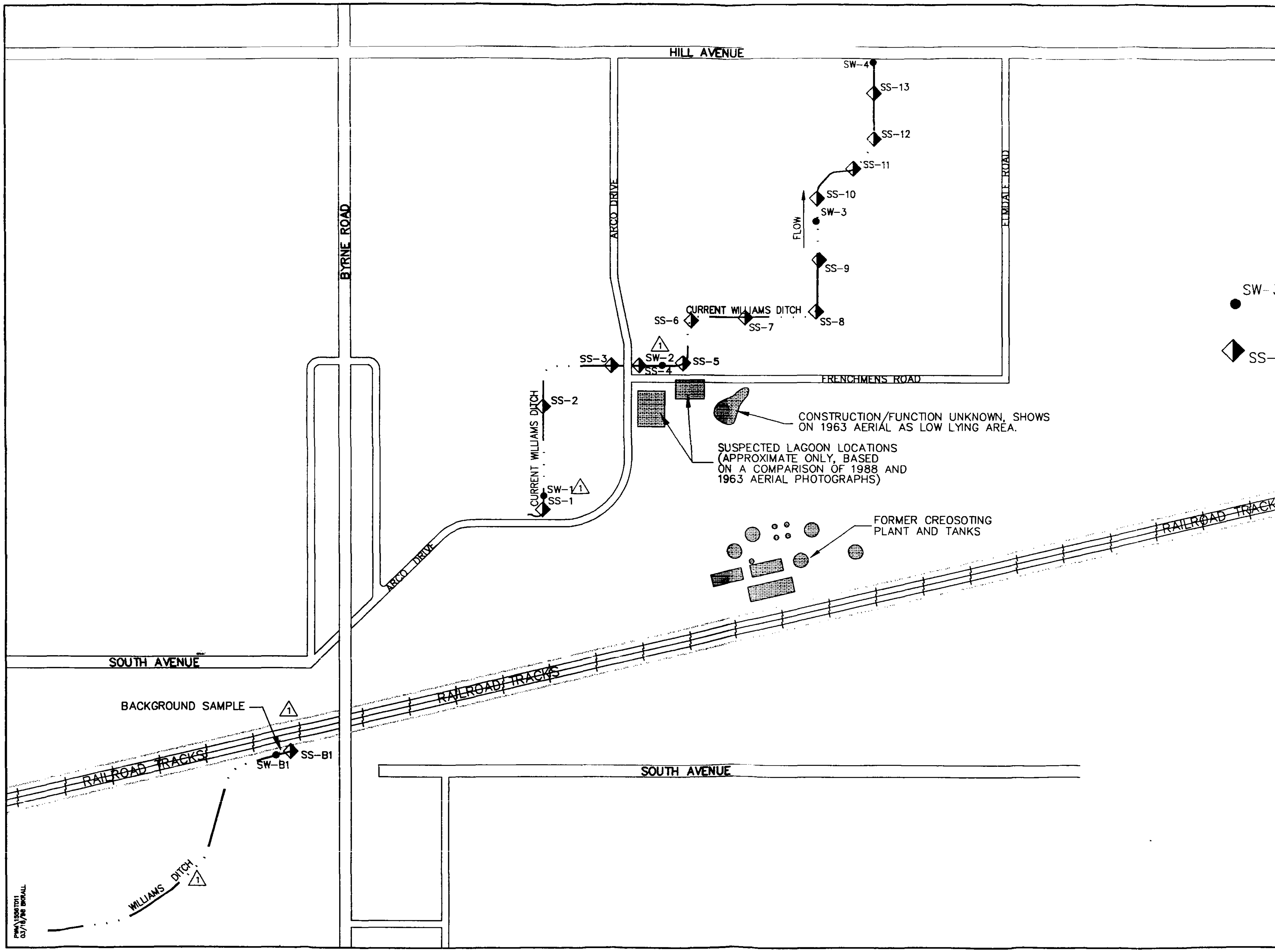
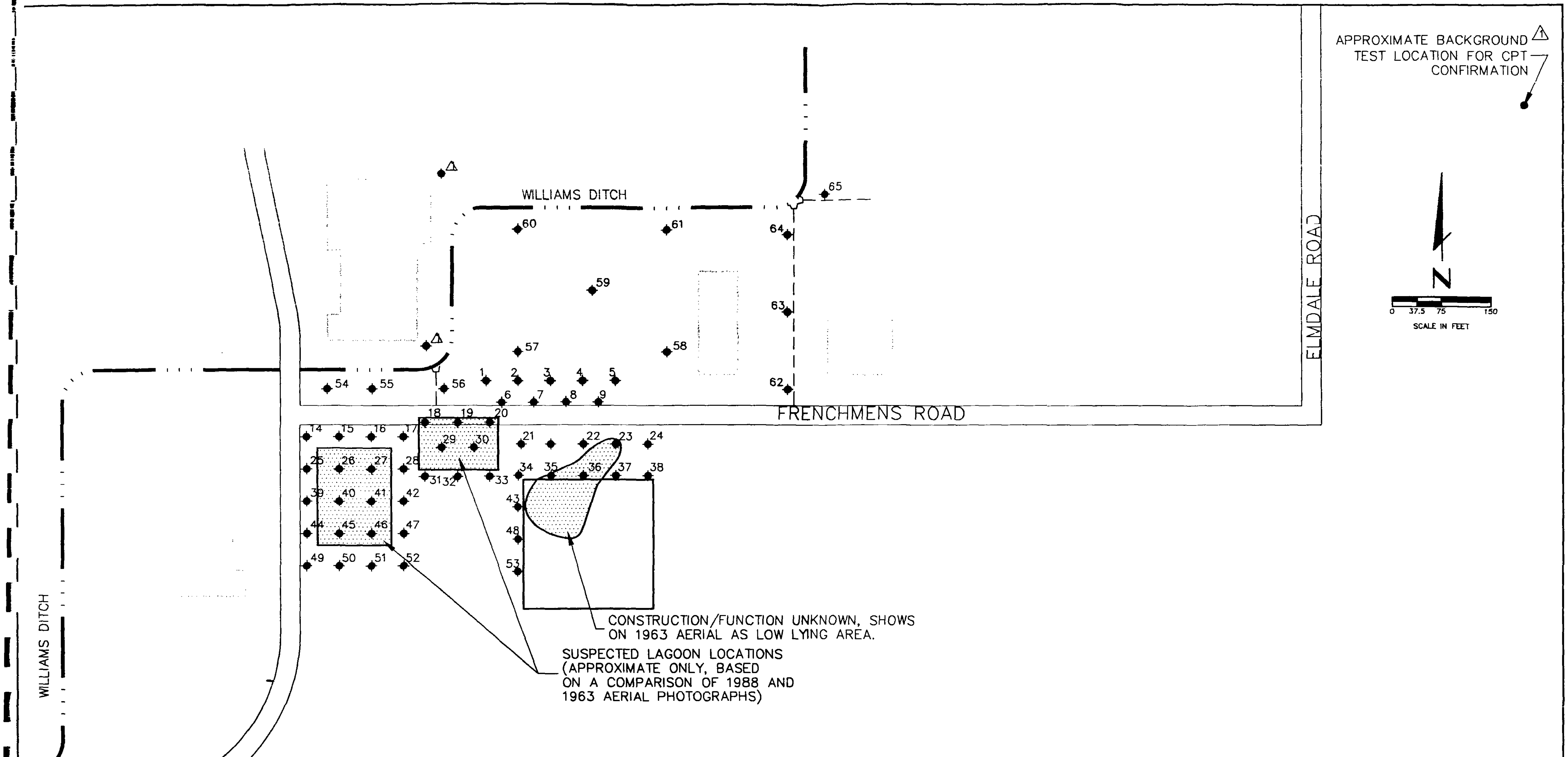



FIGURE A1

Hull & Associates, Inc.
TOLEDO, OHIO

KERR-McGEE CHEMICAL, LLC.
TOLEDO TIE TREATMENT SITE
WILLIAMS DITCH
SEDIMENT AND SURFACE WATER SAMPLING LOCATIONS
CITY OF TOLEDO, LUCAS CO., OHIO

DATE: FEBRUARY 1998 (REVISED 3-18-98) 1 PWM001




⚠ NOTE:
THE ACTUAL LOCATION AND NUMBER OF CPT BORINGS WILL BE SUBJECT TO MODIFICATION IN THE FIELD DEPENDING UPON:
1.) THE CONSISTENCY OF THE LIF SIGNALS AND
2.) VISUAL OBSERVATIONS

LEGEND
◆ PROPOSED CPT BORING LOCATION

FIGURE A2

Hull & Associates, Inc.
TOLEDO, OHIO

KERR-McGEE CHEMICAL, LLC.
TOLEDO TIE TREATMENT SITE

CPT BORING LOCATION MAP

CITY OF TOLEDO, LUCAS CO., OHIO

DATE:
FEBRUARY 1998 (REVISED 3-18-98) ⚠ PWM001

# ATTACHMENT A

Hull & Associates, Inc.
Standard Operating Procedure

# SOP NO. F1000

## Decontamination of Field Equipment

# SOP No. F1000
# DECONTAMINATION OF FIELD EQUIPMENT

## 1.0 Purpose

This section documents the procedures that will be followed when decontaminating field equipment. The equipment may include split spoon soil samplers, bailers, trowels, shovels, hand augers, drilling rigs, soil vapor sampling equipment, or any other type of reusable equipment used during field investigations.

In appropriate, decontamination will be performed as a quality assurance measure and safety precaution. Proper decontamination will be performed to minimize cross contamination between sampling locations or sampling intervals and transporting potentially contaminated materials off-site.

Decontamination of the drilling rigs, if appropriate, will be conducted in a designated decontamination area. Most smaller equipment (e.g., submersible pumps, etc.) can be decontaminated at the sampling location or between collection points. All decontamination materials that cannot be recycled will be properly packaged and disposed of based upon the nature of contamination.

## 2.0 Equipment and Materials

- High-pressure steam cleaner
- Cleaning fluids: non-phosphatic soap and/or detergents, potable water, distilled/deionized water, hydrochloric/nitric acid, isopropanol, acetone, methanol, and/or hexane
- Shovels and brushes
- Paper towels
- Disposable gloves
- Waste storage containers: plastic bags, drums, boxes
- Cleaning containers: plastic buckets, etc.
- Plastic sheeting
- Personal protective equipment

## 3.0 General

A. All decontamination will be performed under the assumption that the equipment is contaminated.

B. An adequate supply of all decontamination equipment and materials will be available on site.

## 4.0 Procedures

The following sections present the decontamination procedures that will be followed during the performance of all field tasks. If different or more extensive procedures are required, they will be pre-approved by the Project Manager and Quality Assurance Officer.

### 4.1 Drilling Rig and Associated Equipment

A. All equipment associated with the selected drilling method coming in contact with potential contamination, both as part of subsurface equipment advancement and due to aboveground contact with drilling fluids, extracted soils, drill rig lubricants and fuels, etc., will be decontaminated prior to use of this equipment for soil boring advancement. At the discretion of the Project Manager, the entire drilling rig may be decontaminated due to foreign substances adhering two the rig as a result of operations, transplant from off-site, or travel between soil boring locations.

B. A high-pressure steam cleaner should be used to remove foreign material from inside and outside of drilling equipment that will not come into contact with test samples. Decontamination of sampling equipment (e.g., split-spoon samplers) is described in section 4.2.

C. All liquid and solid material produced from this operation will be collected and properly contained.

D. The date, time, and decontamination procedure used will be recorded on the boring log or daily field report or in a field notebook.

### 4.2 Split Spoon Barrel Sampler

To ensure that the potential for cross contamination is minimized during subsurface investigations, the split spoon sampler will be decontaminated between sampling intervals.

A. After collecting the split spoon sample, the sampler will be disassembled and decontaminated by first physically removing any adhering soil material from the sampler.

B. The sampler will be placed in a bucket containing a non-phosphatic soap solution (e.g., *Liquinox*) and scrubbed until visibly clean.

C. The sampler will then be thoroughly rinsed with potable water until all soap solution is removed.

D. The sampler will be reassembled.

## 4.3 Submersible Pump

This procedure will be employed to decontaminate the submersible pumps that are used in well purging and/or development operations.

A. After removing the pump from the well, all exterior surfaces (the housing and hose) will be wiped with clean paper towels and placed on clean plastic. If any extraneous material is present on the outside of the pump or hose, it will be removed using a stiff brush.

B. The pump will then be placed in a suitably sized container of non-phosphatic soap solution (e.g., *Liquinox*) and potable water. If possible, the pump will be turned on to circulate the solution through the pump.

C. If sampling for metals, local sampling protocol may require that the pump will be placed in a bucket containing ten percent hydrochloric or nitric acid and, if possible, turned on to circulate the acid through the pump. If sampling for organics, local sampling protocol may also require placing the pump in solvent pesticide grade isopropanol, acetone, methanol, and/or hexane alone, or if required, in some combination, and turned on to circulate the solution through the pump. **The compatibility of any corrosive materials with the internal or external parts of the pump must be verified prior to their use. In addition, the use of flammable materials for decontamination is prohibited unless the pump is certified to be intrinsically safe.**

D. Following each cleaning sequence described in B and C above, the pump will then be placed in a suitably sized container of clean potable or distilled water and then thoroughly rinsed. The pump will be turned on until the internal portion of the pump and tubing is free of cleaning solution; otherwise, the pump will be hand-circulated around the container and clean water will be cascaded into the pump. The outside of the pump housing will also be thoroughly rinsed with potable or distilled water. The last rinse applied to the pump system will always be distilled water.

E. The pump and hosing will be properly stored to ensure that the system remains clean during transportation to other well heads. The pump and hosing will not be allowed to come in contact with the ground at any time during handling and transportation. If this occurs, the pump and tubing will be recleaned.

F. All liquids and waste materials produced during this operation will be properly stored and disposed as determined by the Project Manager.

## 4.4 Bailers

This section documents the procedures that will be followed during the decontamination of re-useable bailers employed during purging or sampling operations.

A. After removing a dedicated bailer from the well, or a non-dedicated bailer from its transport packaging, it will be wiped with clean paper towels and placed on clean plastic.

B. The bailer will be scrubbed with non-phosphatic soap solution inside and out. The inside of the bailer will be scrubbed with a cylinder brush to ensure that interior walls are thoroughly cleaned.

C. If sampling for metals, local sampling protocol may require that the bailer is rinsed with ten percent hydrochloric or nitric acid. If sampling for organic, local sampling protocol may also require that the bailer be rinsed with solvent-grade isopropanol, acetone, methanol, and/or hexane alone, or if required, in some combination.

D. Following completion of each cleaning sequence described above in B and C, the bailer will be rinsed with potable (as approved by the Project Manager) or distilled water until it is free of the soap solution.

E. The bailer will then be wiped dry using paper towels.

F. The bailer will be properly stored and the bailer cord properly disposed of to prevent contamination from occurring between sampling locations. To properly store the bailer, the entire bailer will be placed in its dedicated PVC storage tube or wrapped in inert material (e.g., *Saran* wrap, aluminum foil, etc.).

G. All paper towels and plastic sheeting used during decontamination procedures will be placed in a trash bag and properly disposed. Liquids used for decontamination of the bailers will be collected, properly stored, and disposed of as directed by the Project Manager.

## 4.5 Soil Gas Sampling Equipment

This section documents the procedures that will be adhered to during the decontamination of soil gas survey equipment between sampling locations.

A. Any extraneous soil material on the sampling rods will be removed prior to washing the rods.

B. The collection rods, nipples, and shield point adapter will be placed in a suitably sized container and thoroughly scrubbed with a brush and non-phosphatic soap (e.g., *Liquinox*) solution.

C. The parts will be completely rinsed with distilled water until all residue of the soap solution is removed.

D. The collection rods will be wiped dry with paper towels and properly stored to prevent contamination between sampling locations.

## 4.6 Sampling Spoons, Trowels, or Scoops

A. All buckets, brushes, spoons, spades or trowels will be cleaned with a non-phosphate detergent (e.g., *Liquinox*) solution and rinsed well with distilled water prior to sample collection.

B. Two decontamination buckets will be prepared with an adequate amount of cleaning solution and one decontamination brush will be dedicated to each bucket.

C. Vinyl, latex, or nitrile gloves will be worn.

D. A two-stage decontamination process will be used. The grossly soiled sampling device will first be cleaned in the first bucket, rinsed with distilled water, then cleaned again in the second bucket and finally rinsed thoroughly with distilled water. The first bucket will be dedicated for removing the gross soil, sludge, or sediment.

E. When the cleaning solution in the first bucket becomes dirty, the solution shall be properly discarded and the second bucket will replace the first. A new cleaning solution will be prepared in the original first bucket and it will now become the second bucket.

## 4.7 Monitoring Well/Piezometer/Ground-Water Extraction Well/Soil Vapor Probe/Vacuum Extraction Well Casing and Screen Pre-Installation Decontamination Procedures

This section documents the procedures that will be adhered to during the pre-installation decontamination of a monitoring well, piezometer, ground-water extraction well, soil vapor probe, and vacuum extraction well casings and screens and bottom caps. The following procedures apply to both PVC and Type 304 stainless steel casing and screen materials.

A. All personnel handling the well materials will be wearing clean vinyl, nitrile or latex protective gloves.

B. When the well casing and screen is removed from the packaging, the well materials will be placed on clean saw horses or an equivalent support device.

The well materials shall be washed with a clean stiff brush and a non-phosphatic soap solution (e.g., *Liquinox*).

C. After the well materials are washed, they will be rinsed with potable water.

D. A high pressure steam cleaner may then be used to thoroughly remove any remaining soap or soiled areas.

E. The final step will be to rinse the well materials with distilled water. The well materials shall remain on the saw horses until well construction commences.

### 4.8 Interface Probe and Water Level Indicator

The entire length of the probe and tape that was inserted into the well will be decontaminated by washing with a non-phosphate detergent (e.g., *Liquinox*) and then rinsing with distilled water.

## 5.0 Documentation

The procedure(s) employed, date(s), and time(s) will be recorded on the appropriate documentation (e.g., daily field reports, field notebooks, boring logs, etc.). Any deviation from these procedures must be noted. Deviations must be approved by the Project Manager and Quality Assurance Officer.

## 6.0 Special Notes

None

## 7.0 Applicable Standards and References

None

# SOP NO. F1006

## Field Soil Classification/Description

# SOP No. F1006
# FIELD SOIL CLASSIFICATION/DESCRIPTION

## 1.0 Purpose

This section documents the procedures to visually classify soils in the field. All descriptions shall follow ASTM D653 and D2488. As a field guide, the attached table summarizes the parameters to properly classify a soil sample.

## 2.0 Equipment and Materials

- Pocket penetrometer
- Visual soil classification reference (e.g., attached table)
- Dropper bottle with diluted HCl

## 3.0 Procedures

In general, soil descriptions shall be written in the following format:

- density or consistency classification/color/second major constituent (adjective)/major constituent (principle noun)/minor constituents/moisture content/other characteristics

For example: hard brown silty clay with a trace of sand and gravel, moist, fractured.

Moisture contents may be written as: saturated, wet, very moist, moist, slightly moist, and dry.

Damp may be substituted for moist.

Other characteristics that should be mentioned are: fractures, fracture fillings, laminations, varves, organic content, oxidation, mineral fillings, sorting, and any evidence of potential contamination.

See attached Table.

## 4.0 Documentation

A sample identification will be documented on the soil boring logs.

## 5.0 Special Notes

None

## 6.0 Applicable Standards and References

None

## HULL & ASSOCIATES, INC.
## PROCEDURES FOR VISUAL SOIL CLASSIFICATION

### TERMINOLOGY

Unless otherwise noted, all terms utilized herein refer to the Standard Definitions presented in ASTM D 653 and D 2488.

### PARTICLE SIZES

| | | | |
|---|---|---|---|
| Boulders | | - | Greater than 12 inches (305mm) |
| Cobbles | | - | 3 inches (76.2mm) to 12 inches (305mm) |
| Gravel: | Coarse | - | 3/4 inches (19.05mm) to 3 inches (76.2mm) |
| | Fine | - | No. 4 - 3/16 inches (4.75mm) to 3/4 inches (19.05mm) |
| Sand: | Coarse | - | No. 10 (2.00mm) to No. 4 (4.75mm) |
| | Medium | - | No. 40 (0.425mm) to No. 10 (2.00mm) |
| | Fine | - | No. 200 (0.074mm) to No. 40 (0.425mm) |
| Silt | | - | 0.005mm to 0.074mm |
| Clay | | - | Less than 0.005mm |

### COHESIONLESS SOILS

**Classification**

The major soil constituent is the principle noun, i.e. sand, silt, gravel. The second major soil constituent and other minor constituents are reported as follows:

| Second Major Constituent (percent by weight) | | | Minor Constituents (percent by weight) | | |
|---|---|---|---|---|---|
| Trace | - | 1 to 12% | Trace | - | 1 to 12% |
| Adjective (clayey, silty, etc.) | - | 12 to 35% | Little | - | 12 to 23% |
| And | - | Over 35% | Some | - | 23 to 33% |

| Density Classification | Relative Density % | Approximate Range of (N) |
|---|---|---|
| Very Loose | 0-15 | 0-4 |
| Loose | 16-35 | 5-10 |
| Medium Dense | 36-65 | 11-30 |
| Dense | 66-85 | 31-50 |
| Very Dense | 86-100 | Over 50 |

Relative Density of Cohesionless Soils is based upon an evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

### COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier; i.e., silty clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils; i.e., silty clay, trace of sand, little gravel.

| Consistency | Unconfined Compressive Strength (psf) | | | Approximate Range of (N) |
|---|---|---|---|---|
| Very Soft | Below | | 500 | 0 - 2 |
| Soft | 500 | - | 1000 | 3 - 4 |
| Medium Stiff | 1000 | - | 2000 | 5 - 8 |
| Stiff | 2000 | - | 4000 | 9 - 15 |
| Very Stiff | 4000 | - | 8000 | 16 - 30 |
| Hard | 8000 | - | 16000 | 31 - 50 |
| Very Hard | Over | | 16000 | Over 50 |

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

### SAMPLE DESIGNATIONS

AS - Auger Sample - Directly from auger flight.
BS - Miscellaneous Samples - Bottle or Bag.
S - Split Spoon Sample - ASTM D 1586-67.
LS - Liner Sample S with liner insert 3 inches in length.
ST - Shelby Tube Sample - 3 inch diameter unless otherwise noted.
PS - Piston Sample - 3 inch diameter unless otherwise noted.
RC - Rock Core - NX core unless otherwise noted.

*STANDARD PENETRATION TEST (ASTM D1586)*: A 2.0" outside-diameter, 1-3/8" inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The second and third blows are added to determine the Standard Penetration Resistance (N).

# SOP NO. F1007

## YSI Model 33 S-C-T Meter

HULL & ASSOCIATES, INC.
TOLEDO, OHIO

**SOP No. F1007**
***YSI* MODEL 33 S-C-T METER**

## 1.0 Purpose

This SOP documents the procedures that will be followed during field analysis of salinity, specific conductance, and temperature with the *YSI* Model 33 instrument. These parameters may be measured while purging wells to determine if equilibrium has been achieved, and should be measured after purging and before samples are collected for laboratory analysis.

## 2.0 Equipment and Materials

- *YSI* Model 33 S-C-T Meter and instrument logbook.
- *YSI* Model 3300 series conductivity/temperature probe; 1.0 cell constant.
- Potassium Chloride (KCl) standardization solution
- Chart of <u>Temperature Conversions for Correcting Specific Conductivity (in Degrees Celsius)</u>
- Distilled water and *Liquinox*.

## 3.0 Procedures

### A. Calibration

1. The meter correction factor (MCF) will be determined monthly. The conductivity cell will be rinsed with at least three portions of KCl solution. The temperature of a fourth portion will be adjusted to 25.0 ± 0.1°C. Four separate measurements will be recorded and the results averaged (Cond.). The conductivity readings will be expressed in microsiemens per centimeter (mS/cm). The temperature will be recorded in degrees Celsius (°C). The MCF will be calculated as follows:

$$MCF = \frac{[\text{concentration of standardization solution}]}{[\text{Cond.}]}$$

2. The calibration data and the MCF will be recorded in an instrument logbook. An instrument logbook will be kept with the instrument to document any time any employee calibrates or adjusts the equipment.

### B. Setup

1. The meter will be adjusted to zero (if necessary) by turning the bakelite screw on the meter face so that the meter needle coincides with the zero on the conductivity scale.

2. The meter will be calibrated by turning the MODE control to REDLINE and adjusting the REDLINE control so the meter needle lines up with the redline on the meter face. If this cannot be accomplished, the batteries should be replaced.

3. The probe will be plugged into the probe jack on the side of the instrument.

4. The probe will be inserted in the solution to be measured.

C. Temperature

1. The MODE control will be set to TEMPERATURE. The probe temperature will be allowed to come to equilibrium with that of the solution before reading. The temperature will be read on the bottom scale of the meter in degrees Celsius.

D. Conductivity

1. The meter scale will be switched to X100. If the reading is below 50 on the 0-500 mS/cm range (or 5.0 on the 0-50 mS/cm range), the meter will be switched to X10. If the reading is still below 50 (or 5.0 mS/cm), the meter will be switched to the X1 scale. The meter will be read and the reading multiplied by the appropriate scale factor. The measurements are not temperature compensated; therefore, the field value will be adjusted by finding the appropriate temperature correction factor (TCF) from the chart labelled Temperature Conversions for Correcting Specific Conductivity (in Degrees Celsius) for the actual temperature of the measured solution. The field value will then be multiplied by the MCF and divided by the TCF.

EXAMPLE: (assume a MCF of 0.98 and a TCF of 0.7651)

| | |
|---|---|
| Meter Reading: | 247 mS/cm |
| Scale: | X10 |
| Field Value: | 2470 mS/cm |

Conductivity: $2470 \times \frac{0.98}{0.7651} = 3164$ mS/cm

2. When measuring on the X100 and X10 meter scales, the CELL TEST button will be depressed. The meter reading should fall less than 2 percent. If the fall is greater, the probe is fouled and the measurement is in error. The probe will be cleaned and the conductivity re-measured.

NOTE: The CELL TEST will not function on the X1 scale.

E. Salinity

1. The sample temperature will be determined and the temperature dial adjusted to that value.

2. The meter scale will be switched to X100. If the reading is above 500 mS/cm, the salinity value is beyond the measurement range.

3. If the reading is in range, the meter will be switched to SALINITY and the salinity will be read on the red 0-40 parts per thousand (ppt) meter scale.

4. The CELL TEST button will be depressed. The fall in meter reading should be less than 2 percent. If the fall is greater, the probe is fouled and the measurement is in error. The probe will be cleaned and the salinity re-measured.

## 4.0 Documentation

The cell constant/correction factor (CF) should be determined monthly. All calibration data and the CF will be recorded in the instrument logbook and on the standard data sheet and given to the supervisor for inclusion in the monthly QC report. All sample measurements shall be recorded on the Ground-water Monitoring Well Data Sheet.

## 5.0 Special Notes

Quality Control

1. The redline mode will be checked prior to sample analysis.
2. A duplicate will be run for every 10 samples.
3. The calibration will be checked monthly.

Troubleshooting

1. The instrument settings and calculations will be checked.
2. The cell will be cleaned and inspected. See your supervisor and the cell instruction booklet.
3. The batteries will be replaced.
4. The calibration will be re-checked.
5. Any unresolved problems will be reported to the supervisor.
6. All problems and steps will be recorded in the instrument logbook and on an appropriate HAI field form.

## 6.0 Applicable Standards and References

Yellow Springs, Inc., Model 33 S-C-T Meter Operation Manual

# SOP NO. 1008

## Orion 230A p~~Ph~~H and Temperature Meter

HULL & ASSOCIATES, INC.
TOLEDO, OHIO

March 1998~~FEBRUARY 1998~~
PWM001D.003

**SOP NO. 1008**
***ORION* 230A pH AND TEMPERATURE METER**

## 1.0 Purpose

This section documents the procedures that will be followed during field analysis of pH and temperature.

## 2.0 Equipment and Materials

- *Orion* 230A Digital pH and Temperature Meter
- pH 4.0 buffer solution and container
- pH 7.0 buffer solution and container
- pH 10.0 buffer solution and container
- Electrode Filling and Electrode Storage Solutions
- Containers for Samples (e.g., glass jars)
- Distilled Water

## 3.0 Procedures

A. Prior to operating, a self-test will be performed as follows:

1. The BNC shorting plug will be attached to the BNC connector on top of meter.

2. The **Power** key will be depressed. If the battery indicator is displayed, the battery will be replaced.

3. The instrument will be turned off.

4. The **Power** key will be depressed and immediately the **yes** key will be depressed. The instrument will automatically perform electronic and hardware diagnostic tests. The main display will show 7E57 and the number on the bottom of the display indicates the test field being run. There will be eight test fields during this check.

5. After test field number seven, a "0" will appear on the display. Press each key on the panel in any order within ten seconds, and the self-test will be completed and the meter will automatically shut off.

6. The meter will be powered back on and it should read 7.0$\pm$.02 and 25°C. If this does not happen, refer to the operating manual (page 15) under Checkout Procedures (model 230A).

B. The meter will be manually calibrated with two buffers as follows:

1. The probe will be attached to the instrument attaching the BNC to the sensor input, pushing down, and turning clockwise to lock. The ATC plug will be firmly attached. The protective cap will be removed from the sensor end of the probe. If the expected pH of the sample is less than 7.0, the pH 4.0 and 7.0 buffer solutions will be used. If the expected pH of the sample is greater than 7.0, the pH 7.0 and 10.0 buffer solutions will be used.

   * The sensor is very sensitive and should be kept in distilled water between samples and when not in use while in the field. Extreme care must be exercised to prevent excessive shock to this instrument and probe.

2. The pH electrode with be repeatedly rinsed with distilled water.

3. The electrode will be placed into the first buffer-solution.

4. The instrument will be turned on and the **Cal** key will be depressed. The word **Calibrate** will be displayed above the main readout and **P1** will be displayed in the lower field which indicates point one of calibration.

5. When the instrument has reached a stable reading, **Ready** will be displayed. Either of the keys with a blue arrow will be depressed and the first digit will start flashing. The arrow keys will be used to display the correct value and the **Yes** key will be depressed. The second digit will start flashing. This process will be continued until all the digits have been correctly entered. The display will remain frozen for two seconds, then **P2** will be displayed in the lower field indicating the meter is ready for the second point of calibration.

6. The electrode will be rinsed with distilled water and placed in the second buffer. Step 5 will be repeated for the second buffer value.

7. The electrode slope will then be displayed in the main field with **SLP** in the lower field. The slope should be 92% to 102%. If the slope is out of range, contact *Orion's* service department for required actions.

C. A sample will be analyzed as follows:

1. The instrument will be calibrated in accordance with Section B.

2. The electrode will be thoroughly rinsed with distilled water prior to measuring the sample.

3. The electrode will be placed into the sample. When the display indicates **Ready**, the pH and temperature readings will be recorded. This model automatically adjusts the pH reading based on a temperature of 25 degrees Celsius. The actual temperature of the sample will be displayed.

4. The probe will be rinsed and placed into distilled water between each sample.

D. The instrument will be prepared for storage as follows:

1. The instrument will be turned off.

2. The electrode will be disconnected from the instrument.

3. The probe will be rinsed with distilled water. The electrode protective cap will be filled with the storage solution and the cap placed on the end of the electrode.

4. The battery will be removed from the instrument.

* The storage solution should not be confused with the filling solution used for the interior of the electrode. The filling solution will be replaced periodically in-house by the Equipment Manager. The instrument should not be used for 24 hours after changing the filling solution.

E. The following maintenance requirements are noted:

1. The pH electrode must always have filling solution in the probe. The level of filling solution must always be above the reference junction and at least one inch above the sample level on immersion. The fill hole should not be covered whenever the electrode is in use.

2. The tip of the pH electrode is vary fragile and must be kept moist at all times. Fill the plastic cap with the storage solution, and place cap on the electrode for storage.

## 4.0 Documentation

At a minimum, the data will be recorded in a field book or the Ground-Water Data Sheet. Additional documentation may be required by the Project Manager.

## 5.0 Special Notes

The pH/temperature meter is very sensitive to extreme heat and especially cold conditions ($<$ 4°C). It is important to keep the meter in a temperature controlled environment (e.g., inside the cab of the truck).

## 6.0 Applicable Standards and References

*ORION Laboratory Group* Portable pH/ISE Meters Instruction Manual

# SOP NO. F2002

Decommissioning of Overburden/Glacial Geotechnical Soil Boearings

## SOP No. F2002
## DECOMMISSIONING OF OVERBURDEN/GLACIAL GEOTECHNICAL SOIL BORINGS

### 1.0 Purpose

This section documents procedures to decommission geotechnical borings drilled entirely in glacial/overburden material.

### 2.0 Equipment and Materials

- Drilling rig with hollow-stem augers or drive/spin casing
- Sodium-bentonite or cement-bentonite slurry
- Concrete

### 3.0 Procedures

A. The geotechnical boring to be decommissioned will be sealed by using a thick slurry mixture of sodium-bentonite or cement-bentonite slurry, which is injected at the bottom of the borehole using a tremie pipe. The casing or auger stem will be periodically filled as a section of the casing or augers is withdrawn to maintain a continuous seal. When completed, the slurry will be allowed to settle for approximately 18 to 24 hours. The borehole will then be reinspected and additional grout will be added if necessary.

B. After the slurry has reached a static level, the remaining annular space will be sealed with approximately three feet of concrete (in traffic areas). In areas which can support vegetative growth, the slurry will be leveled at approximately two feet below ground surface. The remaining two feet will then be filled with topsoil.

### 4.0 Documentation

All pertinent data such as the total depth of drilling, the amount of slurry used, the mixture of slurry used, the thickness of the slurry column, and the thickness of the concrete plug will be recorded on the soil boring log. The decommissioning of any geotechnical soil boring shall be performed under prior approval of the Project Manager.

### 5.0 Special Notes

If a new boring and/or monitoring well is installed, it will be placed approximately ten feet away and hydraulically upgradient from the previous location to prevent any potential effect of the sodium-bentonite slurry on the ground-water quality.

### 6.0 Applicable Standards and References

None

# SOP NO. F3011

Surface-Water Sample Collection

# SOP No. F3011
# SURFACE-WATER SAMPLE COLLECTION

## 1.0 Purpose

This section documents the procedures for collecting water samples from surface water and outfalls.

## 2.0 Equipment and Materials

- Sample vials for VOC analysis
- pH meter
- Specific conductivity meter
- Thermometer
- Latex gloves
- Shipping cooler
- 500 ml sampling jar

## 3.0 Procedures

A. The sample vial will be submerged in the flowing stream. The vial's mouth should be positioned so that it faces upstream while the sampling personnel are standing downstream. **NOTE:** If preservatives are to be added to the sample, the sample container cannot be utilized as the sampling device. A certified clean glass laboratory jar with a minimum volume of 500 ml shall be utilized as the sampling device.

B. A sample will be collected from the flowing stream and the sample stream will be allowed to flow gently down the side of the jar with minimal entry turbulence.

C. Delivery of the sample will continue until the jar is completely full. The sample will then be transferred from the sample jar to the vial. A convex meniscus should form on the mouth of the vial. The vial will be capped tightly to eliminate headspace and the sealed vials will be checked for air bubbles by inverting them and tapping gently against the wrist.

D. The sample vials will be preserved and labeled at the sampling location.

E. After all samples have been collected, field determination of pH, conductivity, and temperature will be made, if required. All samples will be properly packed in the shipping cooler prior to leaving the sampling location.

F. Finally, all materials used during sample collection must be either properly disposed, or in the case of reusable equipment, must be properly decontaminated following the procedures documented in HAI SOP No. F1000.

## 4.0 Documentation

A number of different documents should be completed and maintained as part of the sampling effort. The documents must provide a summary of the sample-collection procedures and conditions, shipment method, the analyses requested, and the custody history. The following is a list of the documents that must be filled out:

- Water sample collection record/field notebook
- Sample labels
- Chain-of-custody records
- Shipping receipt (e.g., Fed Ex receipt)

## 5.0 Special Notes

None

## 6.0 Applicable Standards and References

None

# SOP NO. F3014

Chain-of-Custody Procedures

## SOP No. F3014
## CHAIN-OF-CUSTODY PROCEDURES

### 1.0 Purpose

This SOP documents the chain-of-custody (COC) procedures that will be employed during all sampling activities.

### 2.0 Equipment and Materials

- Indelible ink ball-point pens
- Chain-of-custody records
- One-gallon size *Zip-Loc* (or equivalent) storage bags

### 3.0 General

A completed COC record must accompany every sample from the point of collection to delivery to the laboratory. A single COC record may accompany several samples as long as all the samples are contained in a single unit (e.g., cooler, box, etc.). All COCs will be kept in one-gallon *Zip-Loc* bags to prevent damage from melting ice, broken samples, and bad weather. A copy of every completed COC record will be maintained by the Quality Assurance Officer (QAO).

### 4.0 Procedures

#### 4.1 Completion of COC Record

A. The COC record is initiated in the field by the sampler(s) immediately after a sample is collected. Figure F3014-1 illustrates a properly completed COC.

B. The sample identification number of the sample will be recorded in the box labeled "Sample Identification".

C. Next, the appropriate sample matrix will be indicated by completing the box labeled "Sample Matrix" with the number that corresponds to the sample matrix type. Sample matrices are listed near the top of the COC record.

D. The number of containers that makes a complete sample will be recorded in the box labeled "No. of Containers".

E. If the sample is to be analyzed for metals, the box labeled "Metals" shall be completed to indicate whether the sample fractions for metals have been filtered. A "F" will be used to indicate that the metals were filtered and a "N" will indicate that they were not filtered. Occasionally, some samples may require metal fractions to be filtered and not filtered (e.g., analyses for dissolved and total metals). In this case a "B" will be used to indicate that the sample contains both filtered and non-filtered fractions. If the sample does not require analyses for metals a single line will be drawn through this box.

F. The date and time (military) of sample collection will be recorded in the box labeled "Sampling Date/Time".

G. The requested analytical methods will be recorded in the diagonal spaces provided under the box labeled "Analyses". The preservatives added to the containers for each analytical method will be indicated by recording the letter in the box labeled "Preservatives" that corresponds to the preservative added. The preservatives and corresponding letters are listed near the top of the COC record. Finally, a check mark(s) will be made under each fraction for which a particular sample will be analyzed.

H. Any comments relating to the collected sample(s) can ~~be~~ recorded in the box labeled "Comments". These comments may indicate special handling or analytical instructions for the laboratory (e.g., compositing instructions) or may be used to indicate the location of sample collection.

I. Additional information required on the COC record includes the person the analytical reports should be sent to, client, site, project description, project number, names of all samplers involved in sample collection, where the samples are to be delivered, method of delivery, and airbill number (if applicable).

## 4.2 Transfer of Custody

A. The COC record must document the transfer of custody each time the sample(s) changes hands. The National Enforcement Investigations Center (NEIC) of the EPA defines custody as:

1. the sample is in your physical possession;

2. the sample is within view after being in your physical possession;

3. the sample was in your possession and then you locked it or sealed it to prevent tampering; and/or

4. the sample is placed in a designated secure place with limited access to authorized personnel only.

B. When transferring custody of samples, the person in custody (e.g., the sampler) must sign the box labeled "Relinquished By" and fill in the date and time (military time) the custody of the samples was relinquished. The person accepting custody of the samples must then sign the box labeled "Received By" and complete the date and time (military time) the custody of the samples was accepted.

C. The above procedures must be followed until the samples are delivered to the laboratory. In cases where a commercial courier (e.g., Federal Express) is used to deliver the samples, the person relinquishing custody to the courier should put the name of the courier in the "Received By" box and seal the COC inside the cooler. Most couriers have a policy against signing for custody of samples.

D. The pink copy (bottom) of the COC will be retained before the samples are shipped and the remaining copies (white and yellow) of the COC are delivered to the laboratory. The pink copy will then be immediately given to the QAO. The white copy will be returned by the laboratory with the final report.

## 5.0 Documentation

Chain-of-custody record

## 6.0 Special Notes

None

## 7.0 Applicable Standards and References


U.S. Environmental Protection Agency. NEIC Policies and Procedures. EPA-330/9-78-001-R. May 1978. (Revised February 1983.)

U.S. Environmental Protection Agency. User's Guide to the Contract Laboratory Program. Office of Emergency and Remedial Response. December 1986.

U.S. Environmental Protection Agency. A Compendium of Superfund Field Operations Methods. EPA/540/P-87/001, December 1987.

Hull & Associates, Inc.
6631 Commerce Parkway
Suite E
Dublin, Ohio 43017
Phone: (614) 793-8777
FAX: (614) 793-9070

# CHAIN OF CUSTODY RECORD

WHITE -- ORIGINAL
PINK -- LAB USE
YELLOW -- LAB USE (MUST BE RETURNED W/ REPORT)

REPORT TO: K. Wildman

(Please forward results to address at top left)

Client: ABC COMPANY Site: ANYTOWN, OHIO
Project: GW SAMPLING Project #: ABCAI
Samplers: J. Small, T. Large

SAMPLE MATRIX
1. WATER
2. SOIL
3. SLUDGE
4. OIL
5. TISSUE
6. SEDIMENT
OTHER:

PRESERVATIVES
A – Cool only, 4° C
B – $HNO_3$ pH<2
C – $H_2SO_4$ pH<2
D – NaOH pH>12
E – ZnAcetate + NaOH, pH>9
F – $Na_2S_2O_3$(0.008%)
G – HCl pH < 2

METALS
F – FILTERED
N – NOT FILTERED
B – BOTH

With the exception of parameters not requiring preservation (G), all samples are kept at 4° C.

ANALYSES

| SAMPLE IDENTIFICATION | SAMPLE MATRIX | NO. OF CONTAINERS | METALS | SAMPLING DATE/TIME | G24 (PRESERVATIVES: G) | DISS Pb (PRESERVATIVES: B) | PH-150.1 (PRESERVATIVES: A) | | | | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABCAI-MW1-001-D153 | 1 | 5 | F | 1-31-93 / 15:00 | ✓ | ✓ | ✓ | | | | | | | | Sample HAD STRONG ODOR |
| ABCAI-MW2-001-D153 | 1 | 3 | N | 1-31-93 / 15:30 | ✓ | | ✓ | | | | | | | | |
| ABCAI-MW3-001-D153 | 1 | 1 | B | 1-31-93 / 15:30 | | | ✓ | | | | | | | | |

| RELINQUISHED BY: | DATE / TIME | RECEIVED BY: | DATE / TIME |
|---|---|---|---|
| J. Small | DATE: 1-31-93 TIME: -16-32 | K. COURIER | DATE: 2-1-93 TIME: -9-30 |
| K. COURIER | DATE: 2-1-93 TIME: -12-30 | M. LAB | DATE: 2-1-93 TIME: -12-30 |
| | DATE: - - TIME: - - | | DATE: - - TIME: - - |
| | DATE: - - TIME: - - | RECEIVED FOR LAB BY: | DATE: - - TIME: - - |

Deliver To: SOME LAB, INC.
Method of Delivery: FED. EX.
Airbill Number: 1513411876

NOTES: PLEASE CALL ASAP WITH VERBAL RESULTS.

FIGURE F3014-1

Hull & Associates, Inc.

CHAIN OF CUSTODY RECORD

DATE: AUGUST 1993

STD

INI/D880034
08/06/93SCHOONOV

# SOP NO. F3017

Surface and Shallow Subsurface Soil, Sludge, or Sediment Sampling (Not Submerged)

## SOP No. F3017
## SURFACE AND SHALLOW SUBSURFACE SOIL, SLUDGE, OR SEDIMENT SAMPLING (NOT SUBMERGED)

### 1.0 Purpose

The following procedure will be followed when collecting surface and near-surface soil, sludge, or sediment samples for chemical analyses. The method is limited to sampling near surface sample locations that are not located beneath a liquid surface.

### 2.0 Equipment and Materials

- Stainless steel sampling spoon, trowel, or scoop (not plated or painted)
- Stainless steel spade or trowel (not plated or painted)
- Stainless steel mixing bowl or *Teflon* tray
- Sample containers
- Latex or vinyl sampling gloves
- Decontamination supplies

### 3.0 Procedures

*Discrete Samples*

A. All sampling equipment will be decontaminated prior to use in accordance with the procedures specified in SOP No. F1000.

B. If a shallow subsurface sample is desired, the precleaned trowel or spade will be used to remove the top layer of soil to the desired sample depth.

C. A thin layer of soil from the area which comes in contact with the trowel or spade will be removed with the pre-cleaned sampling device (e.g., spoon) and discarded.

D. The sample will be collected with the pre-cleaned sampling device and placed into an appropriate sample container.

E. The sample container will be labeled with the appropriate information. All chain-of-custody documents will be completed and the appropriate information recorded in the field log book or report form.

F. The labeled sample container will be placed in an appropriate transport container with ice (if required) as soon as possible.

G. All sampling equipment will be decontaminated after use in accordance with the procedures specified in SOP No. F1000.

*Composite Samples*

Discrete samples that comprise a composite sample will be collected as described above; however, a stainless steel mixing bowl or *Teflon* tray will be used for mixing the discrete samples prior to placing the sample in the laboratory-supplied sample containers.

## 4.0 Documentation

Each sample container will be labeled as directed by the project Work Plan or by the Project Manager and a chain-of-custody record will be completed. A field log book will also be kept describing the sampling procedures, the sample locations, all sample identification numbers, and any deviations from this SOP. An HAI Surface and Shallow Subsurface Soil Sampling Field Data Sheet or other designated field record form will be filled out. If possible, photographs may be taken of the sample jars prior to packaging for shipment, the sample locations, the sample equipment, or the sampling technique utilized by field personnel. A map or site sketch will be constructed of all sample locations using field measurements or from coordinates obtained from a qualified surveyor. If necessary, an elevation of the sample location will be obtained and referenced to an appropriate benchmark.

## 5.0 Special Notes

The decontamination process will be repeated after each use and between all discrete sample locations. If compositing strategies are used, decontamination may only be required between composite samples (i.e., not between discrete samples that form a single composite). Sample gloves will be changed in between each location.

## 6.0 Applicable Standards and References

U.S. EPA. Characterization of Hazardous Waste Sites, A Methods Manual - Vol. II, Available Sampling Methods. 2nd Ed. 12/84. EPA/600/4-84/076.

# SOP NO. F3019

. Submerged Sludge or Sediment Sampling

## SOP No. F3019
## SUBMERGED SLUDGE OR SEDIMENT SAMPLING

### 1.0 Purpose

The following procedure will be followed when collecting submerged samples of sludges or sediments. The method is limited to sample locations that are beneath a liquid surface.

### 2.0 Equipment and Materials

- *Ponar* grab sampler
- Nylon or polypropylene line or *Teflon* coated stainless steel cable
- Stainless steel mixing bowl or *Teflon* tray
- Stainless steel spoon or trowel (not plated or painted)
- Sample containers
- Latex or vinyl sampling gloves
- Decontamination supplies

### 3.0 Procedures

A. All sampling equipment will be decontaminated prior to use in accordance with the procedures specified SOP No. F1000.

B. The appropriate length of sample line will be attached to the decontaminated *Ponar* sampler. A 3/16 inch diameter braided line will normally provide sufficient strength; however, a 3/8 inch diameter line will allow easier hand hoisting.

C. The distance beneath the surface to the sample location will be marked on the sample line. A second mark will be identified on the sample line that is approximately one meter less to indicate proximity to the sample depth. This will identify the depth where the lowering rate will be reduced to minimize unnecessary disturbance of the sludges or sediments. If sampling relatively shallow streams, the proximity mark (the second mark) is not required because the sampler will be lowered very slowly until the bottom is contacted.

D. The free end of sample line will be tied to a fixed support to prevent the accidental loss of sampler. Allow sufficient slack in the line to perform sampling activities.

E. The sampler jaws will be opened until they latch. From this point on, the sampler will be supported by it's sample line only or the sampler may be tripped and the jaws will close prematurely.

F. The sampler will be lowered until the proximity mark (the first mark encountered) is reached.

G. The rate of descent will be slowed through the last meter of fall until contact with the bottom is felt.

H. The sample line will be allowed to slack several inches. In strong currents, more slack may be necessary to release the mechanism. In shallow streams, the top of the clamshells may be gently pushed with a probe to allow the clamshells to sink deeper into the sediments and maximize recovery.

I. The sampler will be raised clear of the liquid surface.

J. The sampler will be placed into a stainless steel or *Teflon* tray and opened. The sampler will be lifted clear of the tray.

K. The sample will be collected with the pre-cleaned sampling device (e.g., spoon) and placed into an appropriate sample container.

L. The sample container will be labelled with the appropriate information. All chain-of-custody documents will be completed and the appropriate information recorded in the field log book or report form.

M. The labeled sample container will be placed in an appropriate transport container with ice packs (if required) as soon as possible.

N. All sampling equipment will be decontaminated in accordance with the procedures specified in SOP No. F1000.

## 4.0 Documentation

Each sample container will be labeled as directed by the project Work Plan or by the Project Manager and a chain-of-custody record will be completed. A field log book will also be kept describing the sampling procedures, the sample locations, all sample identification numbers, and any deviations from this SOP. A field record form or log book will be filled out. If possible, photographs may be taken of the sample jars prior to packaging for shipment, the sample locations, the sample equipment, or the sampling technique utilized by field personnel. A map or site sketch will be constructed of all sample locations using field measurements or from coordinates obtained from a qualified surveyor. If necessary, an elevation of the sample location will be obtained and referenced to an appropriate benchmark.

## 5.0 Special Notes

None

## 6.0 Applicable Standards and References

U.S.EPA. Characterization of Hazardous Waste Sites, A Methods Manual - Vol. II, Available Sampling Methods. 2nd Ed. 12/84. EPA/600/4-84-076.

# APPENDIX A

# Soil Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | ETL28 MESY28 | ETL30 MESY30 | ETL31 MESY31 | ETL34 MESY34 | | | ETL29 MESY29 | ETL32 MESY32 | ETL33 MESY33 |
|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 3/17/93 | 3/18/93 | 3/18/93 | 3/18/93 | | | 3/17/93 | 3/18/93 | 3/18/93 |
| TIME SAMPLE COLLECTED | 1701 | 1130 | 1115 | 415 | | | 1830 | 1200 | 1200 |
| SAMPLE DEPTH | 1' | 4 5'-5 5' | 1 5'-2.5' | 4 5'-5 5' | | | 2'-3' | 4'-5' | 4'-5 |
| QA/QC DESCRIPTION (if applicable) | MS MSD | | | Background | | | | | Dup of ETL32 |

| COMPOUND DETECTED (ug/kg) | LOW | | | | | | MED | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | | *CRQL* | | | |
| chloromethane | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| bromomethane | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| vinyl chloride | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| chloroethane | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| methylene chloride | *10 ug kg* | 30BU | 14BU | 13BU | 12BU | | *1200 ug kg* | 1500U | 680J | 1500U |
| acetone | *10 ug kg* | 13U | 27 | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| carbon disulfide | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| 1,1-dichloroethene | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| 1,1-dichloroethane | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| 1,2-dichloroethene (total) | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| chloroform | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| 1,2-dichloroethane | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| 2-butanone | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 10000D | 2200 | 7200D |
| 1,1,1-trichloroethane | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| carbon tetrachloride | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| bromodichloromethane | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| 1,2-dichloropropane | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| cis-1,3-dichloropropene | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| trichloroethene | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| dibromochloromethane | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| 1,1,2-trichloroethane | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| benzene | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 2400 | 430J | 1000J |
| trans-1,3-dichloropropene | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| bromoform | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| 4-methyl-2-pentanone | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| 2-hexanone | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| tetrachloroethene | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| 1,1,2,2-tetrachloroethane | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 1500U | 1500U | 1500U |
| toluene | *10 ug kg* | 13U | 14U | 13U | 12U | | *1200 ug kg* | 18000 | 3500 | 12000 |

## Soil Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inroganics) | | ETL28 MESY28 | ETL30 MESY30 | ETL31 MESY31 | ETL34 MESY34 | | | ETL29 MESY29 | ETL32 MESY32 | ETL33 MESY33 |
|---|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | | 3/17/93 | 3/18/93 | 3/18/93 | 3/18/93 | | | 3/17/93 | 3/18/93 | 3/18/93 |
| TIME SAMPLE COLLECTED | | 1701 | 1130 | 1115 | 415 | | | 1830 | 1200 | 1200 |
| SAMPLE DEPTH | | 1' | 4.5'-5.5' | 1.5'-2.5' | 4.5'-5.5' | | | 2'-3' | 4'-5' | 4'-5' |
| QA/QC DESCRIPTION (if applicable) | | MS MSD | | | Background | | | | | Dup of ETL32 |
| **COMPOUND DETECTED (ug/kg)** | *LOW* | | | | | | *MED* | | | |
| *VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | | *CRQL* | | | |
| chlorobenzene | *10 ug/kg* | 13U | 14U | 13U | 12U | | *1200 ug/kg* | 1500U | 1500U | 1500U |
| ethyl benzene | *10 ug/kg* | 13U | 14U | 13U | 12U | | *1200 ug/kg* | 1500U | 2800 | 11000 |
| styrene | *10 ug/kg* | 13U | 14U | 13U | 12U | | *1200 ug/kg* | 10000 | 1800 | 7400 |
| xylenes (total) | *10 ug/kg* | 13U | 14U | 13U | 12U | | *1200 ug/kg* | 74000E | 20000 | 93000E |
| | | | | | | | | | | |
| *SEMI-VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | | *CRQL* | | | |
| phenol | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| bis(2-chloroethyl)ether | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 2-chlorophenol | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 1,3-dichlorobenzene | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 1,4-dichlorobenzene | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 1,2-dichlorobenzene | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 2-methylphenol | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 2,2-oxybis(1-chloropropane) | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 4-methylphenol | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| n-nitroso-di-n-propylamine | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| hexachloroethane | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| nitrobenzene | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| isophorone | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 2-nitrophenol | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 2,4-dimethylphenol | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| bis(2-chloroethoxy)methane | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 2,4-dichlorophenol | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 1,2,4-trichlorobenzene | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| naphthalene | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 3700000D | 2300000D | 2500000D |
| 4-chloroaniline | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| hexachlorobutadiene | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 4-chloro-3-methylphenol | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 40000U | 41000U | 42000U |
| 2-methylnaphthalene | *330 ug/kg* | 21000U | 450U | 430U | 390U | | *10000 ug/kg* | 550000E | 700000D | 760000D |

# Soil Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inroganics) | | ETL28 MESY28 | ETL30 MESY30 | ETL31 MESY31 | ETL34 MESY34 | | | ETL29 MESY29 | ETL32 MESY32 | ETL33 MESY33 |
|---|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | | 3/17/93 | 3/18/93 | 3/18/93 | 3/18/93 | | | 3/17/93 | 3/18/93 | 3/18/93 |
| TIME SAMPLE COLLECTED | | 1701 | 1130 | 1115 | 415 | | | 1830 | 1200 | 1200 |
| SAMPLE DEPTH | | 1' | 4.5'-5.5' | 1.5'-2.5' | 4.5'-5.5' | | | 2'-3' | 4'-5' | 4'-5' |
| QA/QC DESCRIPTION (if applicable) | | MS MSD | | | Background | | | | | Dup of [illegible] |
| **COMPOUND DETECTED (ug/kg)** | *LOW* | | | | | | *MED* | | | |
| *SEMI-VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | | *CRQL* | | | |
| hexachlorocyclopentadiene | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| 2,4,6-trichlorophenol | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| 2,4,5-trichlorophenol | *800 ug kg* | 51000U | 1100U | 1000U | 940U | | *25000 ug kg* | 98000U | 100000U | 100000U |
| 2-chloronaphthalene | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| 2-nitroaniline | *800 ug kg* | 51000U | 1100U | 1000U | 940U | | *25000 ug kg* | 98000U | 100000U | 100000U |
| dimethylphthalate | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| acenaphthylene | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 100000 | 140000 | 130000 |
| 2,6-dinitrotoluene | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| 3-nitroaniline | *330 ug kg* | 51000U | 1100U | 1000U | 940U | | *25000 ug kg* | 98000U | 100000U | 100000U |
| acenaphthene | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 370000E | 720000D | 710000D |
| 2,4-dinitrophenol | *800 ug kg* | 51000U | 1100U | 1000U | 940U | | *25000 ug kg* | 98000U | 100000U | 100000U |
| 4-nitrophenol | *800 ug kg* | 51000U | 1100U | 1000U | 940U | | *25000 ug kg* | 98000U | 100000U | 100000U |
| dibenzofuran | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 330000E | 560000D | 570000D |
| 2,4-dinitrotoluene | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| diethylphthalate | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| 4-chlorophenyl-phenyl ether | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| fluorene | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 440000E | 790000D | 770000D |
| 4-nitroaniline | *800 ug kg* | 51000U | 1100U | 1000U | 940U | | *25000 ug kg* | 98000U | 100000U | 100000U |
| 4,6-dinitro-2-methylphenol | *800 ug kg* | 51000U | 1100U | 1000U | 940U | | *25000 ug kg* | 98000U | 100000U | 100000U |
| n-nitrosodiphenylamine | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| 4-bromophenyl-phenyl ether | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| hexachlorobenzene | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| pentachlorophenol | *800 ug kg* | 51000U | 1100U | 1000U | 940U | | *25000 ug kg* | 98000U | 100000U | 100000U |
| phenanthrene | *330 ug kg* | 6800J | 450U | 430U | 390U | | *10000 ug kg* | 1400000D | 2000000D | 2000000D |
| anthracene | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 310000 | 250000 | 200000 |
| carbazole | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 150000 | 120000 | 110000 |
| di-n-butylphthalate | *330 ug kg* | 21000U | 220J | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| fluoranthene | *330 ug kg* | 45000 | 450U | 89J | 390U | | *10000 ug kg* | 480000E | 1300000D | 300000D |
| pyrene | *330 ug kg* | 46000 | 450U | 66J | 390U | | *10000 ug kg* | 300000 | 870000D | 840000D |

## Soil Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | ETL28 MESY28 | ETL30 MESY30 | ETL31 MESY31 | ETL34 MESY34 | | | ETL29 MESY29 | ETL32 MESY32 | ETL33 MESY33 |
|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 3/17/93 | 3/18/93 | 3/18/93 | 3/18/93 | | | 3/17/93 | 3/18/93 | 3/18/93 |
| TIME SAMPLE COLLECTED | 1701 | 1130 | 1115 | 415 | | | 1830 | 1200 | 1200 |
| SAMPLE DEPTH | 1' | 4.5'-5.5' | 1.5'-2.5' | 4.5'-5.5' | | | 2'-3' | 4'-5' | 4'-5' |
| QA/QC DESCRIPTION (if applicable) | MS MSD | | | Background | | | | | Dup of ETL32 |

| COMPOUND DETECTED (ug/kg) | LOW | | | | | | MED | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *SEMI-VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | | *CRQL* | | | |
| butylbenzylphthalate | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| 3,3-dichlorobenzidine | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| benzo(a)anthracene | *330 ug kg* | 28000 | 450U | 55J | 390U | | *10000 ug kg* | 160000 | 300000 | 270000 |
| chrysene | *330 ug kg* | 26000 | 450U | 76J | 390U | | *10000 ug kg* | 140000 | 240000 | 210000 |
| bis(2-ethylhexyl)phthalate | *330 ug kg* | 21000U | 450BU | 430U | 46J | | *10000 ug kg* | 40000U | 41000U | 42000U |
| di-n-octylphthalate | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| benzo(b)fluoranthene | *330 ug kg* | 79000 | 450U | 210J | 390U | | *10000 ug kg* | 170000 | 340000E | 300000 |
| benzo(k)fluoranthene | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 41000U | 42000U |
| benzo(a)pyrene | *330 ug kg* | 30000 | 450U | 430U | 390U | | *10000 ug kg* | 75000 | 150000 | 140000 |
| indeno(1,2,3-cd)pyrene | *330 ug kg* | 19000J | 450U | 430U | 390U | | *10000 ug kg* | 39000J | 90000 | 86000 |
| dibenzo(a,h)anthracene | *330 ug kg* | 8700J | 450U | 430U | 390U | | *10000 ug kg* | 20000J | 50000 | 44000 |
| benzo(g,h,i)perylene | *330 ug kg* | 21000U | 450U | 430U | 390U | | *10000 ug kg* | 40000U | 18000J | 18000J |
| | | | | | | | | | | |
| *PESTICIDES/PCBs* | *CRQL* | | | | | | | | | |
| alpha-BHC | *1.7 ug kg* | 22U | 2.3U | 2.2U | 2.0U | | | 21U | 21U | 22U |
| beta-BHC | *1.7 ug kg* | 22U | 2.3U | 2.2U | 2.0U | | | 21U | 21U | 22U |
| delta-BHC | *1.7 ug kg* | 22U | 2.3U | 2.2U | 2.0U | | | 21U | 21U | 22U |
| gamma-BHC (Lindane) | *1.7 ug kg* | 22U | 2.3U | 2.2U | 2.0U | | | 21U | 21U | 22U |
| heptachlor | *1.7 ug kg* | 22U | 2.3U | 2.2U | 2.0U | | | 21U | 21U | 22U |
| aldrin | *1.7 ug kg* | 22U | 2.3U | 2.2U | 2.0U | | | 21U | 21U | 22U |
| heptachlor epoxide | *1.7 ug kg* | 22U | 2.3U | 2.2U | 2.0U | | | 21U | 21U | 22U |
| endosulfan I | *1.7 ug kg* | 560DP | 2.3U | 1.1JP | 2.0U | | | 210DP | 1700D | 1200D |
| dieldrin | *3.3 ug kg* | 42U | 4.5U | 4.3U | 3.9U | | | 40U | 41U | 42U |
| 4,4-DDE | *3.3 ug kg* | 42U | 4.5U | 0.73JP | 3.9U | | | 40U | 360 | 290 |
| Endrin | *3.3 ug kg* | 42U | 4.5U | 4.3U | 3.9U | | | 40U | 41U | 42U |
| Endosulfan II | *3.3 ug kg* | 42U | 4.5U | 4.3U | 3.9U | | | 40U | 41U | 42U |
| 4,4-DDD | *3.3 ug kg* | 48P | 4.5U | 2.3J | 3.9U | | | 40U | 41U | 42U |
| Endosulfan sulfate | *3.3 ug kg* | 42U | 4.5U | 4.3U | 3.9U | | | 40U | 130P | 480DP |
| 4,4-DDT | *3.3 ug kg* | 50P | 4.5U | 3.8J | 3.9U | | | 40U | 41U | 42U |

## Soil Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inroganics) | ETL28 MESY28 | ETL30 MESY30 | ETL31 MESY31 | ETL34 MESY34 | | | ETL29 MESY29 | ETL32 MESY32 | ETL33 MESY33 |
|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 3/17/93 | 3/18/93 | 3/18/93 | 3/18/93 | | | 3/17/93 | 3/18/93 | 3/18/93 |
| TIME SAMPLE COLLECTED | 1701 | 1130 | 1115 | 415 | | | 1830 | 1200 | 1200 |
| SAMPLE DEPTH | 1' | 4.5'-5.5' | 1.5'-2.5' | 4.5'-5.5' | | | 2'-3' | 4'-5' | 4'-5' |
| QA/QC DESCRIPTION (if applicable) | MS/MSD | | | Background | | | | | Dup of ETL32 |

| COMPOUND DETECTED (ug/kg) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *PESTICIDES/PCBs* | *CRQL* | | | | | | | | | |
| methoxychlor | *17.0 ug/kg* | 220U | 23U | 22U | 20U | | | 210U | 210U | 220U |
| endrin ketone | *3.3 ug/kg* | 110P | 4.5U | 4.3U | 3.9U | | | 160P | 440DP | 130P |
| endrin aldehyde | *3.3 ug/kg* | 42U | 4.5U | 4.3U | 3.9U | | | 40U | 41U | 42U |
| alpha-chlordane | *1.7 ug/kg* | 22U | 2.3U | 2.2U | 2.0U | | | 21U | 21U | 22U |
| gamma-chlordane | *1.7 ug/kg* | 14J | 2.3U | 2.2U | 2.0U | | | 21U | 21U | 22U |
| toxaphene | *170 ug/kg* | 2200U | 230U | 220U | 200U | | | 2100U | 2100U | 2200U |
| aroclor-1016 | *33 ug/kg* | 420U | 45U | 43U | 39U | | | 400U | 410U | 420U |
| aroclor-1221 | *33 ug/kg* | 850U | 92U | 87U | 79U | | | 820U | 840U | 860U |
| aroclor-1232 | *67 ug/kg* | 420U | 45U | 43U | 39U | | | 400U | 410U | 420U |
| aroclor-1242 | *33 ug/kg* | 420U | 45U | 43U | 39U | | | 400U | 410U | 420U |
| aroclor-1248 | *33 ug/kg* | 420U | 45U | 43U | 39U | | | 400U | 410U | 420U |
| aroclor-1254 | *33 ug/kg* | 420U | 45U | 43U | 39U | | | 400U | 410U | 420U |
| aroclor-1260 | *33 ug/kg* | 420U | 45U | 43U | 39U | | | 400U | 410U | 420U |

| TCL COMPOUND QUALIFIERS | DEFINITION |
|---|---|
| J | Indicates an estimated value |
| U | Compound was analyzed for but not detected. |
| B | Compound is found in the associated blank as well as in the sample. |
| D | This flag indicates all compounds identified in an analysis at a secondary dilution factor. |
| E | This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument. |
| P | Indicates there is a greater than 25% difference for detected concentrations between two GC columns. The lower value is reported |

# Soil Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inroganics) | ETL28 MESY28 | ETL30 MESY30 | ETL31 MESY31 | ETL34 MESY34 | | | ETL29 MESY29 | ETL32 MESY32 | ETL33 MESY33 |
|---|---|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 3/17/93 | 3/18/93 | 3/18/93 | 3/18/93 | | | 3/17/93 | 3/18/93 | 3/18/93 |
| TIME SAMPLE COLLECTED | 1701 | 1130 | 1115 | 415 | | | 1830 | 1200 | 1200 |
| SAMPLE DEPTH | 1' | 4.5'-5.5' | 1.5'-2.5' | 4.5'-5.5' | | | 2'-3' | 4'-5' | 4'-5' |
| QA/QC DESCRIPTION (if applicable) | MS/MSD | | | Background | | | | | Dup of ETL32 |

| ANALYTE DETECTED (mg/kg) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *TAL METALS/CYANIDE* | *CRDL* | | | | | | | | | |
| aluminum | *40 mg/kg* | 5490 | 3910 | 5880 | 5580 | | | 3490 | 5920 | 7560 |
| antimony | *12 mg/kg* | 11.3B | 8U | 8.4U | 8U | | | 8.1U | 8.2U | 8.1U |
| arsenic | *2 mg/kg* | 11.1 | 0.67B | 3.6 | 2.2B | | | 1.9B | 5.1 | 6.4 |
| barium | *40 mg/kg* | 62.2 | 38.4B | 16.1B | 28.7B | | | 17.6B | 54.1 | 58.9 |
| beryllium | *1 mg/kg* | 0.85B | 0.27B | 0.26U | 0.28B | | | 0.25U | 0.39B | 0.56B |
| cadmium | *1 mg/kg* | 1U | 1U | 1.1U | 1U | | | 1U | 1U | 1U |
| calcium | *1000 mg/kg* | 24100 | 3050 | 1710 | 1390 | | | 1130B | 34500 | 40100 |
| chromium | *2 mg/kg* | 9.7 | 7.2 | 5.2 | 10.1 | | | 6.2 | 10.9 | 13.1 |
| cobalt | *10 mg/kg* | 4.9B | 3B | 2.3B | 4.4B | | | 3.4B | 7.5B | 8.9B |
| copper | *5 mg/kg* | 29.1 | 3.6B | 4.1B | 8.6 | | | 5.9B | 14.7 | 20.5 |
| iron | *20 mg/kg* | 16600 | 3850 | 8230 | 8150 | | | 5200 | 12700 | 24100 |
| lead | *0.6 mg/kg* | 190 | 4.5 | 9 | 5.2 | | | 3.8 | 11.4 | 12.1 |
| magnesium | *1000 mg/kg* | 10300 | 630B | 514B | 1120B | | | 802B | 10900 | 13000 |
| manganese | *3 mg/kg* | 146 | 31.9 | 29.1 | 121 | | | 44.6 | 255 | 343 |
| mercury | *0.1 mg/kg* | 0.17 | 0.13U | 0.13U | 0.13U | | | 0.13U | 0.13U | 0.13U |
| nickel | *8 mg/kg* | 9.8B | 6.2B | 3.6B | 11 | | | 6.2B | 14.8 | 15.8 |
| potassium | *1000 mg/kg* | 601B | 285B | 203B | 545B | | | 413B | 1050B | 1500 |
| selenium | *1 mg/kg* | 0.68B | 0.25U | 0.46B | 0.25U | | | 0.25U | 0.44B | 0.35B |
| silver | *2 mg/kg* | 1.3U | 1.3U | 1.3U | 1.3U | | | 1.3U | 1.3U | 1.3U |
| sodium | *1000 mg/kg* | 148B | 51.1B | 44B | 54.7B | | | 58.7B | 126B | 151B |
| thallium | *2 mg/kg* | 0.34B | 0.25U | 0.26U | 0.31B | | | 0.25U | 0.32B | 0.28B |
| vanadium | *10 mg/kg* | 14.5 | 9.6B | 11.6B | 13.6 | | | 9B | 20.1 | 28.2 |
| zinc | *4 mg/kg* | 123 | 13.4 | 20.2 | 24.4 | | | 17.3 | 93.5 | 94.3 |
| cyanide | *2 mg/kg* | 0.64U | 0.63U | 0.66U | 0.63U | | | 0.63U | 0.64U | 0.64U |

| TAL ANALYTE QUALIFIERS | DEFINITION |
|---|---|
| B | Value is real, but is above instrument detection limit and below contract-required detection limit |
| U | Analyte was analyzed for but not detected |

## Sediment Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | | ETL41 MESY41 | | | ETL38 MESY38 | ETL39 MESY39 | ETL40 MESY40 |
|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | | 3/17/93 | | | 3/17/93 | 3/17/93 | 3/17/93 |
| TIME SAMPLE COLLECTED | | 1500 | | | 1030 | 1225 | 1225 |
| SAMPLE DEPTH | | 0"-4" | | | 0"-4" | 0"-4" | 0"-4" |
| QA/QC DESCRIPTION (if applicable) | | Background | | | MS/MSD | | Dup of ETL39 |
| **COMPOUND DETECTED (ug/kg)** | *LOW* | | | *MED* | | | |
| *VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | *CRQL* | | | |
| chloromethane | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| bromomethane | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| vinyl chloride | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| chloroethane | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| methylene chloride | *10 ug kg* | 22BU | | *1200 ug kg* | 6700U | 3000U | 2800U |
| acetone | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| carbon disulfide | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| 1,1-dichloroethene | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| 1,1-dichloroethane | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| 1,2-dichloroethene (total) | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| chloroform | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| 1,2-dichloroethane | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| 2-butanone | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| 1,1,1-trichloroethane | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| carbon tetrachloride | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| bromodichloromethane | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| 1,2-dichloropropane | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| cis-1,3-dichloropropene | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| trichloroethene | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| dibromochloromethane | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| 1,1,2-trichloroethane | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| benzene | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| trans-1,3-dichloropropene | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| bromoform | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| 4-methyl-2-pentanone | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| 2-hexanone | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| tetrachloroethene | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| 1,1,2,2-tetrachloroethane | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| toluene | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |

## Sediment Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | | ETL41 MESY41 | | | ETL38 MESY38 | ETL39 MESY39 | ETL40 MESY40 |
|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | | 3/17/93 | | | 3/17/93 | 3/17/93 | 3/17/93 |
| TIME SAMPLE COLLECTED | | 1500 | | | 1030 | 1225 | 1225 |
| SAMPLE DEPTH | | 0"-4" | | | 0"-4" | 0"-4" | 0"-4" |
| QA/QC DESCRIPTION (if applicable) | | Background | | | MS MSD | | Dup of ETL39 |
| **COMPOUND DETECTED (ug/kg)** | *LOW* | | | *MED* | | | |
| *VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | *CRQL* | | | |
| chlorobenzene | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| ethyl benzene | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| styrene | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| xylenes (total) | *10 ug kg* | 14U | | *1200 ug kg* | 6700U | 3000U | 2800U |
| | | | | | | | |
| *SEMI-VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | *CRQL* | | | |
| phenol | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| bis(2-chloroethyl)ether | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 2-chlorophenol | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 1,3-dichlorobenzene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 1,4-dichlorobenzene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 1,2-dichlorobenzene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 2-methylphenol | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 2,2-oxybis(1-chloropropane) | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 4-methylphenol | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| n-nitroso-di-n-propylamine | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| hexachloroethane | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| nitrobenzene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| isophorone | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 2-nitrophenol | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 2,4-dimethylphenol | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| bis(2-chloroethoxy)methane | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 2,4-dichlorophenol | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 1,2,4-trichlorobenzene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| naphthalene | *330 ug kg* | 480U | | *10000 ug kg* | 69000J | 24000U | 23000U |
| 4-chloroaniline | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| hexachlorobutadiene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 4-chloro-3-methylphenol | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 2-methylnaphthalene | *330 ug kg* | 480U | | *10000 ug kg* | 4000J | 24000U | 23000U |

## Sediment Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | ETL41 MESY41 | | | ETL38 MESY38 | ETL39 MESY39 | ETL40 MESY40 |
|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 3/17/93 | | | 3/17/93 | 3/17/93 | 3/17/93 |
| TIME SAMPLE COLLECTED | 1500 | | | 1030 | 1225 | 1225 |
| SAMPLE DEPTH | 0"-4" | | | 0"-4" | 0"-4" | 0"-4" |
| QA/QC DESCRIPTION (if applicable) | Background | | | MS/MSD | | Dup of ETL39 |

| COMPOUND DETECTED (ug/kg) | *LOW* | | | *MED* | | | |
|---|---|---|---|---|---|---|---|
| *SEMI-VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | *CRQL* | | | |
| hexachlorocyclopentadiene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 2,4,6-trichlorophenol | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 2,4,5-trichlorophenol | *800 ug kg* | 1200U | | *25000 ug kg* | 420000U | 60000U | 58000U |
| 2-chloronaphthalene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 2-nitroaniline | *800 ug kg* | 1200U | | *25000 ug kg* | 420000U | 600000U | 58000U |
| dimethylphthalate | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| acenaphthylene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 2,6-dinitrotoluene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 3-nitroaniline | *330 ug kg* | 1200U | | *25000 ug kg* | 420000U | 60000U | 58000U |
| acenaphthene | *330 ug kg* | 480U | | *10000 ug kg* | 85000J | 24000U | 23000U |
| 2,4-dinitrophenol | *800 ug kg* | 1200U | | *25000 ug kg* | 420000U | 60000U | 58000U |
| 4-nitrophenol | *800 ug kg* | 1200U | | *25000 ug kg* | 420000U | 60000U | 58000U |
| dibenzofuran | *330 ug kg* | 480U | | *10000 ug kg* | 75000U | 24000U | 23000U |
| 2,4-dinitrotoluene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| diethylphthalate | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 4-chlorophenyl-phenyl ether | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| fluorene | *330 ug kg* | 480U | | *10000 ug kg* | 130000J | 24000U | 23000U |
| 4-nitroaniline | *800 ug kg* | 1200U | | *25000 ug kg* | 420000U | 60000U | 58000U |
| 4,6-dinitro-2-methylphenol | *800 ug kg* | 1200U | | *25000 ug kg* | 420000U | 60000U | 58000U |
| n-nitrosodiphenylamine | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| 4-bromophenyl-phenyl ether | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| hexachlorobenzene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| pentachlorophenol | *800 ug kg* | 1200U | | *25000 ug kg* | 420000U | 60000U | 58000U |
| phenanthrene | *330 ug kg* | 71J | | *10000 ug kg* | 600000 | 4000J | 4000J |
| anthracene | *330 ug kg* | 480U | | *10000 ug kg* | 51000J | 24000U | 23000U |
| carbazole | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| di-n-butylphthalate | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| fluoranthene | *330 ug kg* | 190J | | *10000 ug kg* | 720000 | 11000J | 11000J |
| pyrene | *330 ug kg* | 170J | | *10000 ug kg* | 500000 | 11000J | 9500J |

## Sediment Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | | ETL41 MESY41 | | | ETL38 MESY38 | ETL39 MESY39 | ETL40 MESY40 |
|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | | 3/17/93 | | | 3/17/93 | 3/17/93 | 3/17/93 |
| TIME SAMPLE COLLECTED | | 1500 | | | 1030 | 1225 | 1225 |
| SAMPLE DEPTH | | 0"-4" | | | 0"-4" | 0"-4" | 0"-4" |
| QA/QC DESCRIPTION (if applicable) | | Background | | | MS/MSD | | Dup of ETL39 |

| COMPOUND DETECTED (ug/kg) | *LOW* | | | *MED* | | | |
|---|---|---|---|---|---|---|---|
| ***SEMI-VOLATILE ORGANIC COMPOUNDS*** | ***CRQL*** | | | ***CRQL*** | | | |
| butylbenzylphthalate | *330 ug kg* | 60J | | *10000 ug kg* | 170000U | 11000BJU | 2300BJU |
| 3,3-dichlorobenzidine | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| benzo(a)anthracene | *330 ug kg* | 92J | | *10000 ug kg* | 160000J | 4000J | 3500J |
| chrysene | *330 ug kg* | 110J | | *10000 ug kg* | 180000 | 4100J | 4600J |
| bis(2-ethylhexyl)phthalate | *330 ug kg* | 50J | | *10000 ug kg* | 170000U | 4600J | 3500J |
| di-n-octylphthalate | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| benzo(b)fluoranthene | *330 ug kg* | 190JX | | *10000 ug kg* | 230000X | 8000JX | 5700J |
| benzo(k)fluoranthene | *330 ug kg* | 190JX | | *10000 ug kg* | 230000X | 8000JX | 23000U |
| benzo(a)pyrene | *330 ug kg* | 84J | | *10000 ug kg* | 110000J | 3000J | 3000J |
| indeno(1,2,3-cd)pyrene | *330 ug kg* | 480U | | *10000 ug kg* | 27000J | 24000U | 23000U |
| dibenzo(a,h)anthracene | *330 ug kg* | 480U | | *10000 ug kg* | 170000U | 24000U | 23000U |
| benzo(g,h,i)perylene | *330 ug kg* | 480U | | *10000 ug kg* | 25000J | 24000U | 23000U |

| ***PESTICIDES/PCBs*** | ***CRQL*** | | | | | | |
|---|---|---|---|---|---|---|---|
| alpha-BHC | *1.7 ug kg* | 2.4U | | | 0.88JP | 1.3JP | 3.9U |
| beta-BHC | *1.7 ug kg* | 2.4U | | | 5.9JP | 1.6JP | 3.9U |
| delta-BHC | *1.7 ug kg* | 1.7JP | | | 9.4U | 0.76JP | 11P |
| gamma-BHC (Lindane) | *1.7 ug kg* | 2.4U | | | 9.4U | 4U | 3.9U |
| heptachlor | *1.7 ug kg* | 0.17JP | | | 9.4U | 4U | 3.9U |
| aldrin | *1.7 ug kg* | 0.72JP | | | 10P | 4.6P | 4.1P |
| heptachlor epoxide | *1.7 ug kg* | 2.4U | | | 7.5JP | 4U | 3.9U |
| endosulfan I | *1.7 ug kg* | 2.4U | | | 9.4U | 4U | 3.9U |
| dieldrin | *3.3 ug kg* | 8.3 | | | 92P | 25P | 25P |
| 4,4-DDE | *3.3 ug kg* | 140CD | | | 290P | 260D | 190PCE |
| Endrin | *3.3 ug kg* | 3.5JP | | | 18U | 8.1P | 8.9P |
| Endosulfan II | *3.3 ug kg* | 4.7U | | | 18U | 7.8U | 7.6U |
| 4,4-DDD | *3.3 ug kg* | 93CD | | | 18U | 310PD | 270PEC |
| Endosulfan sulfate | *3.3 ug kg* | 0.91JP | | | 18U | 7.8U | 7.6U |
| 4,4-DDT | *3.3 ug kg* | 130CD | | | 120P | 83 | 94 |

## Sediment Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | ETL41 MESY41 | | | ETL38 MESY38 | ETL39 MESY39 | ETL40 MESY40 |
|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 3/17/93 | | | 3/17/93 | 3/17/93 | 3/17/93 |
| TIME SAMPLE COLLECTED | 1500 | | | 1030 | 1225 | 1225 |
| SAMPLE DEPTH | 0"-4" | | | 0"-4" | 0"-4" | 0"-4" |
| QA/QC DESCRIPTION (if applicable) | Background | | | MS/MSD | | Dup of ETL39 |

| COMPOUND DETECTED (ug/kg) | | | | | | | |
|---|---|---|---|---|---|---|---|
| *PESTICIDES/PCBs* | *CRQL* | | | | | | |
| methoxychlor | *17 ug kg* | 24U | | | 94U | 40U | 39U |
| endrin ketone | *3.3 ug kg* | 4.7U | | | 18U | 7.8U | 7.6U |
| endrin aldehyde | *3.3 ug kg* | 5.9P | | | 220P | 27P | 21P |
| alpha-chlordane | *1.7 ug kg* | 4.5P | | | 11P | 19JD | 13P |
| gamma-chlordane | *1.7 ug kg* | 6JPD | | | 9.4U | 46D | 12 |
| toxaphene | *170 ug kg* | 240U | | | 940U | 400U | 390U |
| aroclor-1016 | *33 ug kg* | 47U | | | 180U | 78U | 76U |
| aroclor-1221 | *33 ug kg* | 96U | | | 370U | 160U | 160U |
| aroclor-1232 | *67 ug kg* | 47U | | | 180U | 78U | 76U |
| aroclor-1242 | *33 ug kg* | 47U | | | 180U | 78U | 76U |
| aroclor-1248 | *33 ug kg* | 47U | | | 180U | 78U | 76U |
| aroclor-1254 | *33 ug kg* | 47U | | | 180U | 78U | 76U |
| aroclor-1260 | *33 ug kg* | 47U | | | 180U | 78U | 76U |

| TCL COMPOUND QUALIFIERS | DEFINITION |
|---|---|
| J | Indicates an estimated value |
| U | Compound was analyzed for but not detected. |
| B | Compound is found in the associated blank as well as in the sample. |
| D | This flag indicates all compounds identified in an analysis at a secondary dilution factor. |
| E | This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument |
| P | Indicates there is a greater than 25% difference for detected concentrations between two GC columns |

## Sediment Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | | ETL41 MESY41 | | | ETL38 MESY38 | ETL39 MESY39 | ETL40 MESY40 |
|---|---|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | | 3/17/93 | | | 3/17/93 | 3/17/93 | 3/17/93 |
| TIME SAMPLE COLLECTED | | 1500 | | | 1030 | 1225 | 1225 |
| SAMPLE DEPTH | | 0"-4" | | | 0"-4" | 0"-4" | 0"-4" |
| QA/QC DESCRIPTION (if applicable) | | Background | | | MS/MSD | | Dup of ETL39 |
| **ANALYTE DETECTED (mg/kg)** | | | | | | | |
| *TAL METALS/CYANIDE* | *CRDL* | | | | | | |
| aluminum | *40 mg kg* | 2710 | | | 18400 | 8450 | 8530 |
| antimony | *12 mg kg* | 4.9U | | | 20.6U | 9.3U | 6.8U |
| arsenic | *2 mg kg* | 2.1B | | | 19.3 | 29.9 | 15.9 |
| barium | *40 mg kg* | 25B | | | 264 | 143 | 152 |
| beryllium | *1 mg kg* | 0.17B | | | 1B | 0.61B | 0.52B |
| cadmium | *1 mg kg* | 1U | | | 4.4U | 3.1 | 2.9 |
| calcium | *1000 mg kg* | 3110 | | | 85600 | 60100 | 61400 |
| chromium | *2 mg kg* | 5.3 | | | 51.5 | 23.9 | 26.2 |
| cobalt | *10 mg kg* | 1.6B | | | 27.2B | 5.1B | 6B |
| copper | *5 mg kg* | 6.7 | | | 90.3 | 69.3 | 70.7 |
| iron | *20 mg kg* | 4120 | | | 31600 | 18200 | 18000 |
| lead | *0.6 mg kg* | 7.6 | | | 149 | 185 | 210 |
| magnesium | *1000 mg kg* | 1170B | | | 27400 | 25100 | 25500 |
| manganese | *3 mg kg* | 71.6 | | | 1550 | 453 | 464 |
| mercury | *0.1 mg kg* | 0.05U | | | 0.22U | 0.09U | 0.08U |
| nickel | *8 mg kg* | 4U | | | 33B | 17.9B | 12.8B |
| potassium | *1000 mg kg* | 174U | | | 1400B | 587B | 617B |
| selenium | *1 mg kg* | 0.3U | | | 1.8BM | 0.9B | 0.84B |
| silver | *2 mg kg* | 0.86U | | | 3.6U | 1.6U | 1.2U |
| sodium | *1000 mg kg* | 36.3B | | | 1650B | 5880 | 5870 |
| thallium | *2 mg kg* | 0.37U | | | 1.5U | 0.63U | 0.68U |
| vanadium | *10 mg kg* | 8.8B | | | 48.2B | 22.7 | 23.1 |
| zinc | *4 mg kg* | 21.4 | | | 701 | 410 | 420 |
| cyanide | *2 mg kg* | 0.68U | | | 2.7U | 1.2U | 1.2U |

| TAL ANALYTE QUALIFIERS | DEFINITION |
|---|---|
| B | Value is real, but is above instrument detection limit and below contract-required detection limit |
| U | Analyte was analyzed for but not detected. |

## Surface Water Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | ETL43 MESY43 | ETL44 MESY44 | ETL45 MESY45 | ETL46 MESY46 | ETL51 |
|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 3/17/93 | 3/17/93 | 3/17/93 | 3/17/93 | 3/17/93 |
| TIME SAMPLE COLLECTED | 935 | 1200 | 1200 | 1510 | 800 |
| SAMPLE DEPTH | | | | | |
| QA/QC DESCRIPTION (if applicable) | MS/MSD | | Dup of ETL44 | Background | Trip Blank |

| COMPOUND DETECTED (ug/l) | | | | | | |
|---|---|---|---|---|---|---|
| *VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | |
| chloromethane | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| bromomethane | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| vinyl chloride | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| chloroethane | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| methylene chloride | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| acetone | *10 ug/l* | 11 | 10U | 10U | 10U | 10U |
| carbon disulfide | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| 1,1-dichloroethene | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| 1,1-dichloroethane | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| 1,2-dichloroethene (total) | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| chloroform | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| 1,2-dichloroethane | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| 2-butanone | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| 1,1,1-trichloroethane | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| carbon tetrachloride | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| bromodichloromethane | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| 1,2-dichloropropane | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| cis-1,3-dichloropropene | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| trichloroethene | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| dibromochloromethane | *10 ug/l* | *10U* | *10U* | *10U* | *10U* | *10U* |
| 1,1,2-trichloroethane | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| benzene | *10 ug/l* | 6J | 10U | 10U | 10U | 10U |
| trans-1,3-dichloropropene | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| bromoform | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| 4-methyl-2-pentanone | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| 2-hexanone | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| tetrachloroethene | *10 ug/l* | 2J | 10U | 10U | 10U | 10U |
| 1,1,2,2-tetrachloroethane | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| toluene | *10 ug/l* | 6J | 10U | 10U | 10U | 10U |

## Surface Water Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | ETL43 MESY43 | ETL44 MESY44 | ETL45 MESY45 | ETL46 MESY46 | ETL51 |
|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 3/17/93 | 3/17/93 | 3/17/93 | 3/17/93 | 3/17/93 |
| TIME SAMPLE COLLECTED | 935 | 1200 | 1200 | 1510 | 800 |
| SAMPLE DEPTH | | | | | |
| QA/QC DESCRIPTION (if applicable) | MS/MSD | | Dup of ETL44 | Background | Trip Blank |

| COMPOUND DETECTED (ug/l) | | | | | | |
|---|---|---|---|---|---|---|
| *VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | |
| chlorobenzene | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| ethyl benzene | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| styrene | *10 ug/l* | 10U | 10U | 10U | 10U | 10U |
| xylenes (total) | *10 ug/l* | 4J | 10U | 10U | 10U | 10U |
| | | | | | | |
| *SEMI-VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | |
| phenol | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| bis(2-chloroethyl)ether | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2-chlorophenol | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 1,3-dichlorobenzene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 1,4-dichlorobenzene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 1,2-dichlorobenzene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2-methylphenol | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2,2-oxybis(1-chloropropane) | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 4-methylphenol | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| n-nitroso-di-n-propylamine | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| hexachloroethane | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| nitrobenzene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| isophorone | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2-nitrophenol | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2,4-dimethylphenol | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| bis(2-chloroethoxy)methane | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2,4-dichlorophenol | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 1,2,4-trichlorobenzene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| naphthalene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 4-chloroaniline | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| hexachlorobutadiene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 4-chloro-3-methylphenol | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2-methylnaphthalene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |

# Surface Water Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | ETL43 MESY43 | ETL44 MESY44 | ETL45 MESY45 | ETL46 MESY46 | ETL51 |
|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 3/17/93 | 3/17/93 | 3/17/93 | 3/17/93 | 3/17/93 |
| TIME SAMPLE COLLECTED | 935 | 1200 | 1200 | 1510 | 800 |
| SAMPLE DEPTH | | | | | |
| QA/QC DESCRIPTION (if applicable) | MS/MSD | | Dup of ETL44 | Background | Trip Blank |

| COMPOUND DETECTED (ug/l) | | | | | | |
|---|---|---|---|---|---|---|
| *PESTICIDES/PCBs* | *CRQL* | | | | | |
| methoxychlor | *0.05 ug l* | 0.5U | 0.5U | 0.5U | 0.5U | N/A |
| endrin ketone | *0.1 ug l* | 0.1U | 0.1U | 0.1U | 0.1U | N/A |
| endrin aldehyde | *0.1 ug l* | 0.1U | 0.1U | 0.1U | 0.1U | N/A |
| alpha-chlordane | *0.05 ug l* | 0.05U | 0.05U | 0.05U | 0.05U | N/A |
| gamma-chlordane | *0.05 ug l* | 0.05U | 0.05U | 0.05U | 0.05U | N/A |
| toxaphene | *5 ug l* | 5U | 5U | 5U | 5U | N/A |
| aroclor-1016 | *1 ug l* | 1U | 1U | 1U | 1U | N/A |
| aroclor-1221 | *1 ug l* | 2U | 2U | 2U | 2U | N/A |
| aroclor-1232 | *2 ug l* | 1U | 1U | 1U | 1U | N/A |
| aroclor-1242 | *1 ug l* | 1U | 1U | 1U | 1U | N/A |
| aroclor-1248 | *1 ug l* | 1U | 1U | 1U | 1U | N/A |
| aroclor-1254 | *1 ug l* | 1U | 1U | 1U | 1U | N/A |
| aroclor-1260 | *1 ug l* | 1U | 1U | 1U | 1U | N/A |

| TCL COMPOUND QUALIFIERS | DEFINITION |
|---|---|
| J | Indicates an estimated value |
| U | Compound was analyzed for but not detected. |
| B | Compound is found in the associated blank as well as in the sample. |
| D | This flag indicates all compounds identified in an analysis at a secondary dilution factor. |
| E | This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument. |
| P | Indicates there is a greater than 25% difference for detected concentrations between two GC columns. |

# Surface Water Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | ETL43 MESY43 | ETL44 MESY44 | ETL45 MESY45 | ETL46 MESY46 | ETL51 |
|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 3/17/93 | 3/17/93 | 3/17/93 | 3/17/93 | 3/17/93 |
| TIME SAMPLE COLLECTED | 935 | 1200 | 1200 | 1510 | 800 |
| SAMPLE DEPTH | | | | | |
| QA/QC DESCRIPTION (if applicable) | MS/MSD | | Dup of ETL44 | Background | Trip Blank |

| COMPOUND DETECTED (ug/l) | | | | | | |
|---|---|---|---|---|---|---|
| *SEMI-VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | |
| hexachlorocyclopentadiene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2,4,6-trichlorophenol | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2,4,5-trichlorophenol | *25 ug/l* | 25U | 25U | 25U | 25U | N/A |
| 2-chloronaphthalene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2-nitroaniline | *25 ugl* | 25U | 25U | 25U | 25U | N/A |
| dimethylphthalate | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| acenaphthylene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2,6-dinitrotoluene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 3-nitroaniline | *25 ug/l* | 25U | 25U | 25U | 25U | N/A |
| acenaphthene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2,4-dinitrophenol | *25 ug/l* | 25U | 25U | 25U | 25U | N/A |
| 4-nitrophenol | *25 ug/l* | 25U | 25U | 25U | 25U | N/A |
| dibenzofuran | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 2,4-dinitrotoluene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| diethylphthalate | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 4-chlorophenyl-phenyl ether | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| fluorene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 4-nitroaniline | *25 ug/l* | 25U | 25U | 25U | 25U | N/A |
| 4,6-dinitro-2-methylphenol | *25 ug/l* | 25U | 25U | 25U | 25U | N/A |
| n-nitrosodiphenylamine | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 4-bromophenyl-phenyl ether | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| hexachlorobenzene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| pentachlorophenol | *25 ug/l* | 25U | 25U | 25U | 25U | N/A |
| phenanthrene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| anthracene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| carbazole | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| di-n-butylphthalate | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| fluoranthene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| pyrene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |

## Surface Water Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | ETL43 MESY43 | ETL44 MESY44 | ETL45 MESY45 | ETL46 MESY46 | ETL51 |
|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 3/17/93 | 3/17/93 | 3/17/93 | 3/17/93 | 3/17/93 |
| TIME SAMPLE COLLECTED | 935 | 1200 | 1200 | 1510 | 800 |
| SAMPLE DEPTH | | | | | |
| QA/QC DESCRIPTION (if applicable) | MS/MSD | | Dup of ETL44 | Background | Trip Blank |

| COMPOUND DETECTED (ug/l) | | | | | | |
|---|---|---|---|---|---|---|
| *SEMI-VOLATILE ORGANIC COMPOUNDS* | *CRQL* | | | | | |
| butylbenzylphthalate | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| 3,3-dichlorobenzidine | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| benzo(a)anthracene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| chrysene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| bis(2-ethylhexyl)phthalate | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| di-n-octylphthalate | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| benzo(b)fluoranthene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| benzo(k)fluoranthene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| benzo(a)pyrene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| indeno(1,2,3-cd)pyrene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| dibenzo(a,h)anthracene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| benzo(g,h,i)perylene | *10 ug/l* | 10U | 10U | 10U | 10U | N/A |
| | | | | | | |
| *PESTICIDES/PCBs* | *CRQL* | | | | | |
| alpha-BHC | *0.05 ug/l* | 0.05U | 0.05U | 0.05U | 0.05U | N/A |
| beta-BHC | *0.05 ug/l* | 0.05U | 0.05U | 0.05U | 0.05U | N/A |
| delta-BHC | *0.05 ug/l* | 0.05U | 0.05U | 0.05U | 0.05U | N/A |
| gamma-BHC (Lindane) | *0.05 ug/l* | 0.05U | 0.05U | 0.05U | 0.05U | N/A |
| heptachlor | *0.05 ug/l* | 0.05U | 0.05U | 0.05U | 0.05U | N/A |
| aldrin | *0.05 ug/l* | 0.05U | 0.05U | 0.05U | 0.05U | N/A |
| heptachlor epoxide | *0.05 ug/l* | 0.05U | 0.05U | 0.05U | 0.05U | N/A |
| endosulfan I | *0.05 ug/l* | 0.065P | 0.05U | 0.05U | 0.05U | N/A |
| dieldrin | *0.1 ug/l* | 0.1U | 0.1U | 0.1U | 0.1U | N/A |
| 4,4-DDE | *0.1 ug/l* | 0.1U | 0.1U | 0.1U | 0.1U | N/A |
| Endrin | *0.1 ug/l* | 0.1U | 0.1U | 0.1U | 0.1U | N/A |
| Endosulfan II | *0.1 ug/l* | 0.1U | 0.1U | 0.1U | 0.1U | N/A |
| 4,4-DDD | *0.1 ug/l* | 0.1U | 0.1U | 0.1U | 0.1U | N/A |
| Endosulfan sulfate | *0.1 ug/l* | 0.1U | 0.1U | 0.1U | 0.1U | N/A |
| 4,4-DDT | *0.1 ug/l* | 0.1U | 0.1U | 0.1U | 0.1U | N/A |

## Surface Water Sampling Results

| CLP SAMPLE NUMBER (ETL=organics, MESY=inorganics) | ETL43 MESY43 | ETL44 MESY44 | ETL45 MESY45 | ETL46 MESY46 | ETL51 |
|---|---|---|---|---|---|
| DATE SAMPLE COLLECTED | 3/17/93 | 3/17/93 | 3/17/93 | 3/17/93 | 3/17/93 |
| TIME SAMPLE COLLECTED | 935 | 1200 | 1200 | 1510 | 800 |
| SAMPLE DEPTH | | | | | |
| QA/QC DESCRIPTION (if applicable) | MS/MSD | | Dup of ETL44 | Background | Trip Blank |

| ANALYTE DETECTED (ug/l) | | | | | | |
|---|---|---|---|---|---|---|
| *TAL METALS/CYANIDE* | *CRDL* | | | | | |
| aluminum | *40 ug l* | 1700 | 315 | 276 | 1030 | N/A |
| antimony | *12 ug l* | 32U | 32U | 32U | 32U | N/A |
| arsenic | *2 ug l* | 2.5B | 1.3B | 1.3B | 1.4B | N/A |
| barium | *40 ug l* | 60B | 36.5B | 36.5B | 23.5B | N/A |
| beryllium | *1 ug l* | 1U | 1U | 1U | 1U | N/A |
| cadmium | *1 ug l* | 4U | 4U | 4U | 4U | N/A |
| calcium | *1000 ug l* | 54500 | 65000 | 64400 | 30400 | N/A |
| chromium | *2 ug l* | 8.4B | 6U | 6U | 6U | N/A |
| cobalt | *10 ug l* | 8.2B | 6U | 6U | 6U | N/A |
| copper | *5 ug* | 14B | 14.4B | 6.9B | 5.2B | N/A |
| iron | *20 ug l* | 3270 | 884 | 811 | 1150 | N/A |
| lead | *0.6 ug l* | 20.3 | 4 | 3.9 | 3.6 | N/A |
| magnesium | *1000 ug l* | 12600 | 13100 | 12900 | 6420 | N/A |
| manganese | *3 ug l* | 247 | 194 | 190 | 29.4 | N/A |
| mercury | *0.1 ug l* | 0.2U | 0.2U | 0.2U | 0.2U | N/A |
| nickel | *8 ug l* | 14B | 12U | 12U | 12U | N/A |
| potassium | *1000 ug l* | 3010B | 2580B | 2360B | 2650B | N/A |
| selenium | *1 ug l* | 1.1B | 1.1B | 1U | 1U | N/A |
| silver | *2 ug l* | 5U | 5U | 5U | 5U | N/A |
| sodium | *1000 mg l* | 198000 | 93500 | 94600 | 4790B | N/A |
| thallium | *2 ug l* | 2.3B | 1U | 1U | 1U | N/A |
| vanadium | *10 ug l* | 6.9B | 5U | 5U | 5U | N/A |
| zinc | *4 ug l* | 93 | 31.4 | 29.1 | 13.9B | N/A |
| cyanide | *2 ug l* | 10U | 10U | 10U | 10U | N/A |

| TAL ANALYTE QUALIFIERS | DEFINITION |
|---|---|
| B | Value is real, but is above instrument detection limit and below CRDL. |
| U | Analyte was analyzed for but not detected |

# APPENDIX B